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Annual Processing Review Number

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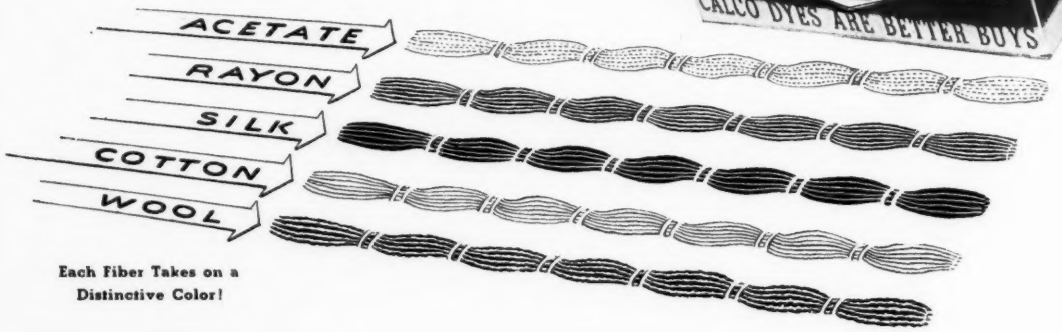

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As mixtures and unions of different fibers become more common and more varied, it becomes more important—and harder—to know exactly what's in any material before dyeing it.

Calco's new Identification Stain Kit gives you the answer—without guesswork—in a matter of minutes! It is supplied in a handy box, complete with directions and a guide swatch showing exactly how acetate, rayon, silk, cotton and wool fibers react to this special Calco stain. Each kit contains enough of this special Calco stain to last for months!

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Annual Processing Review Number

AMERICAN
DYESTUFF REPORTER

VOLUME 28 SEPTEMBER 4, 1939 NUMBER 18

Alphabetical List of

NEW PRODUCTS

FOR TEXTILE WET PROCESSING

Developed Since November, 1938

Alphabetical List of

MANUFACTURERS

SUPPLYING THESE PRODUCTS

WITH the cooperation of the manufacturers of dyestuffs, textile chemical specialties and wet processing and laboratory equipment we have prepared the following list of products which it is understood have been placed on the market or further developed since November, 1938. The list of products has been subdivided according to the classification given above and the individual products are listed in alphabetical order. The names of the manufacturers, in an abbreviated form, appear in capital letters immediately following the name of the product. In many cases the abbreviated name of the manufacturer will immediately indicate to the reader the full name of the company. However, supplementing and appearing at the end of the alphabetical list of products, we have listed alphabetically the key name of all the manufacturers whose products are mentioned, together with the complete firm name and address.

We have tried to make this list as complete and accurate as possible but there may be some unintentional omissions or errors. The properties claimed for the products are claims of the manufacturers. We have depended upon the manufacturers to supply us with a complete list of their new products together with information concerning them. It must be understood, in this connection, that the information we have published is necessarily in a brief form inasmuch as lack of space prohibits the publication of complete details concerning any product. We hope, however, that the information that appears is sufficiently comprehensive to give the reader a specific idea of the intended uses and properties of the product.

DYESTUFFS

A

"Acetamine"* Diazo Black B G D—(DUPONT)—a new acetate rayon fiber color. This color is recommended by the manufacturers for application in the jig and produces full well-penetrated shades of black. "Acetamine" Diazo Black B G D is said to exhibit excellent fastness toward sublimation and crocking and satisfactory fastness to all other destructive influences commonly encountered. It is of interest for application on acetate rayon satins and taffetas.

* Registered Trade Mark.

Acid Orange R O S—(SANDOZ)—is an addition to the Sandoz line of cheap acid dyeing oranges. It is a redder shade than Orange Y (II) and is suitable for the production of cheap browns on yarn and piece goods. Fastness to water, washing and perspiration is low.

Algol Yellow 4 G F Paste—(GENERAL)—a new vat dyestuff which yields bright greenish yellow shades and is said to have very good fastness to washing and to chlorine. It is recommended by the manufacturers for the application to cotton in all stages of its manufacture and particularly for package machine work on account of its good solubility and level dyeing qualities.

Algosol Brilliant Violet I 4 R—(GENERAL)—a new product of the Algosol range which is of interest for various printing styles as well as for dyeing solid shades. For the latter purpose, the new Algosol Brilliant Violet I 4 R is said to be of particular interest, due to its good exhaustion property.

Algosol Brown I V D—(GENERAL)—produces a violet shade of chocolate brown, better than either Algosol Brown I R R D or Algosol Brown I B R. The new color will be of particular interest for printing.

Alizarine Blue Black B A—(NATIONAL)—when dyed on wool by the top chrome method, yields blue-black shades said to be of very good all around fastness. It also may be applied by the bottom chrome or by the ortho chrome method, the latter being particularly desirable for producing light, mode shades of grey, etc. The color is said to possess very good fastness to light, carbonizing and rubbing and good fastness to fulling, washing and perspiration.

Azoform Colors — (SANDOZ) — a group of dyestuffs recommended by the manufacturers to give superior water and wash fastness as compared with direct colors by the use of a simple after treatment. At the same time the dyeing cost is said to be less than by dyeing with developed colors. The line consists of Azoform Scarlet 5 B, Azoform Yellow 2 G, Azoform Green 2 G, Azoform Brown 4 R S, Azoform Black B, Azoform Brilliant Blue G, Azoform Blue W, Azoform Blue F O. All are dischargeable except the last two mentioned.

B

Benzaphen* Blue A—(PHOENIX)—a direct blue which is said to possess relatively good fastness to washing and ironing. It is recommended by the manufacturers for use in unions as well as for rayon and cotton fibers. It discharges to a pure white.

* Registered Trade Mark.

Benzaphen* Blue 2 G N—(PHOENIX)—a direct blue which is unchanged by development with B. O. N. Recommended by the manufacturers especially as a rayon color to be used in conjunction with acetate developed navies in the dyeing of acetate and rayon mixtures, where its fastness to hot pressing and its slight change in artificial light prove of particular merit.

* Registered Trade Mark.

Benzaphen* Brown 2 G N CONC.—(PHOENIX)—is a direct brown of bright yellowish cast said to possess good leveling properties. Its washfastness is greatly improved with a copper-chrome after treatment.

* Registered Trade Mark.

Benzaphen* Diazo Blue G R—(PHOENIX)—produces shades on rayon and cotton which are said to be exceptionally fast to washing and which discharge to a pure white. The color leaves wool and silk undyed and may be used for obtaining cross-dye effects.

* Registered Trade Mark.

Benzaphen* Diazo Bordeaux 2 B L—(PHOENIX)—produces a clear bordeaux shade on rayon, cotton, or silk when developed with Beta Naphthol. The resulting shade is said to be of very good washfastness and lightfastness and to discharge to a pure white.

* Registered Trade Mark.

Benzaphen* Diazo Bordeaux 4 B L—(PHOENIX) — produces a very bluish bordeaux shade on rayon, cotton, or silk. Development with Beta Naphthol is recommended. The resulting shade is said to be of exceptionally good washfastness and excellent lightfastness, and to discharge to a pure white. Furthermore, the shade is said to change only very slightly during the diazotizing and developing procedure. It is recommended by the manufacturers for package and skein dyeing as well as for dischargeable grounds on piece goods.

* Registered Trade Mark.

Benzaphen* Diazo Orange M — (PHOENIX) — yields a very brilliant orange when developed with Beta Naphthol. It is said to be of good washfastness and to discharge to a pure white. It is recommended by the manufacturers for silk as well as rayon and cotton.

* Registered Trade Mark.

Benzaphen* Diazo Scarlet R—(PHOENIX)—a bright scarlet which is said to be of good washfastness when developed with Beta Naphthol, and to discharge to a pure white. It is recommended by the manufacturers for dyeing silk as well as rayon and cotton.

* Registered Trade Mark.

Benzo Fast Copper Blue F B L—(GENERAL)—produces an exceptionally clear, bluish shade on cotton or rayon. This shade is said to be very fast to light and show a very good fastness to water, salt-water, washing and perspiration. The product levels very well and produces tone-in-tone effects on mixed fibers of cotton and rayon. The shade is also easily dischargeable.

Benzo Purpurine 4 B S Soluble—(CIBA)—while Benzo purpurine 4 B is probably one of the best known of direct dyestuffs, it has always suffered from the handicap of imperfect solubility, which has acted against its more extended use. This new type is said to overcome all the former objections and establishes a new standard for this staple product.

Bixaform Fast Black G R Conc.—(BICK)—a black for rayon, leaving acetate rayon absolutely white. The shade is rendered fast to washing by an after-treatment with formaldehyde. Other fastness properties are said to be satisfactory. Discharges white.

Bixamine Fast Red F—(BICK)—a substantive red, suitable for producing heavy red and wine shades on cotton and rayon. Acetate effects are left white. Fastness to light is said to be satisfactory. The shade is slightly altered by acetic acid. Fastness to hot pressing is said to be good and fastness to alkalis very good. Discharges white.

Bixasol Fast Brown R O O—(BICK)—produces a clear reddish brown shade

on silk in a neutral bath. Fastness to light, washing, and perspiration is said to be good. Cotton is left undyed. It is said to be level dyeing and will exhaust from an alkaline bath and is therefore of special interest in dyeing of silk hosiery. Discharges white.

Bixasol Fast Yellow G O O—(BICK)—produces clear yellow shades on silk in a neutral bath, said to possess good all around fastness properties. Cotton is left undyed. Acetate rayon is stained. It is said to be level dyeing and of special interest in dyeing of silk hosiery, as it exhausts in an alkaline boil off bath. Discharges white.

Brilliant Alizarine Fast Violet 6 R—(CIBA)—an especially brilliant acid alizarine, which dyes from a weak acid bath, or from a neutral bath. The shades are very clear and tend to fluoresce, which effect is particularly noticeable on glossy worsted or mohair. The dyeings are said to be fast to sea water, perspiration and light, hence well adapted for bathing suits, athletic goods, etc. Since cotton, viscose rayon and acetate rayon are reserved and wool may be dyed a full shade from a neutral bath, this new type may be utilized in union dyeing for shading animal fibers. It is stated that the good fastness to light of so brilliant a color makes this a dyestuff of much interest.

Brilliant Alizarine Light Violet F F R—(SANDOZ)—claimed to be one of the brightest as well as fastest to light violets on the market and to possess excellent fastness to perspiration, fresh and salt water, carbonizing and rubbing, making it an important color for bathing suits or sweater yarns. It is best suited for dyeing yarn or tops. It is stated that because of its excelient fastness to stoving and extreme brightness, it should be of considerable interest to the blanket trade. It is an excellent throwster color for silk.

Brilliant Cyanine G—(CIBA)—a neutral dyeing acid dyestuff of clear pure blue shade, suitable for dyeing wool or silk. The dyeings are said to have very good fastness to washing, water, stoving, sea water, perspiration, decatizing, carbonizing and acid milling. The fastness to light is said to be better than the bright acid blues. The solubility being good, it is well adapted for printing wool or silk. Principally used as a self color for knitting yarns, loose wool, nubs, stock for blankets, etc. Dyes level enough from an acetic acid bath to serve for piece dyeing. Dyed shades are dischargeable on wool or silk, but like all similar colors, tend to return slightly after a time.

Brilliant Discharge Blue G—(GENERAL)—an acid color of principal interest for discharge prints on wool and silk. This product does not only discharge very well but it is said to offer the very desirable advantage that the discharges will not develop a bluish tint on exposure to light. The product produces a very bright blue shade said to possess fastness properties which are satisfactory for average silk or wool print work.

Brilliant Euchrysine Orange R—(GENERAL)—a basic dyestuff, recommended by the manufacturers primarily for colored discharges on pure or weighted silk, producing exceptionally bright shades, which in brightness cannot be obtained by mixtures of other basic colors and which produces very uniform results. The product is also recommended by the manufacturers for application printing on cotton or silk.

Brilliant Indo Green 3 G—(GENERAL)—a new acid wool dyestuff of a particularly clear shade. It is said to possess good fastness to water, washing, milling and sea-water, combined with comparatively good fastness to light, which good properties, it is claimed, cannot be obtained with dyestuffs of the same brightness.

C

Carbanthrene Red Brown R Double Paste—(NATIONAL)—produces on cotton, rayon or linen, reddish brown shades, said to possess good fastness to sea water, washing, perspiration and alkali, and excellent fastness to cross dyeing and water. It reduces readily, levels well and is suitable for use in open tubs or machines.

Carbide Fast Grey F S—(CIBA)—a type especially designed for dyeing hosiery in a boil-off bath. It tends to give all its color to the cotton or rayon and leave the silk untinted. The wash fastness and fastness to light are said to be equal to the requirements for full fashioned silk hosiery.

Celliton Fast Dark Brown B—(GENERAL)—produces very deep brown shades said to be of very good fastness to light on acetate rayon. It shows excellent affinity and levels very well.

Celliton Fast Dark Green B—(GENERAL)—produces popular bottle green shades, said to be of good fastness to light, rubbing and hot pressing.

Chloramine Brilliant Violet B—(SANDOZ)—a new bluish violet, said to be particularly noteworthy for its brilliancy of shade and good money value. Light fastness is intermediate between Trisulfon Violet B and the Pyrazol Fast Violets. For the dyeing of cotton and rayon pieces.

Chloramine Garnet N R; Chloramine Garnet R S—(SANDOZ)—See Trisulfon Garnet B R Y Conc.

Chloramine Orange B—(SANDOZ)—a new level dyeing orange, particularly recommended by the manufacturers to the hosiery trade because it produces good shades of orange on both cotton and silk in the boil-off liquor for ladies' hosiery. Just a small toning up of the silk is required to produce uniform shades. For this reason the product is said to be very economical and may also be used as a union color for cotton and wool as well as wool and viscose combinations. Chloramine Orange B pads well on cotton and rayon and is used in the dyeing of rayon lining materials because it is not sensitive to formaldehyde fumes.

Chlorantine* Fast Brown 10 G L L (Patented)—(CIBA)—this new type dyes a yellower shade than the well known 8 G L L type, it also has a superior fastness to light, better dischargeability and levelling properties. The shade is actually a slightly dulled orange, which makes it a useful component in a great variety of combination shades. The fastness to light is said to be its outstanding feature. It dyes viscose rayon deeper than cotton and is inclined to tint acetate rayon a pale yellow. Half-silk materials are dependent on the alkalinity of the bath; silk will dye deeper than cotton from a neutral bath, but will be only dyed a light yellowish tint from a soap and soda bath.

* Registered Trade Mark.

Chlorantine* Fast Orange G L—(CIBA)—this new type is redder and slightly brighter than Chlorantine Fast Orange 2 G L. Its principal use is for dyeing cotton and rayon yarns and pieces. Viscose rayon of variable affinity is dyed perfectly level. In mixed fabrics, rayon is dyed a heavier shade than the cotton, wool and silk are much lighter, while acetate rayon is reserved. In an alkaline soap and soda bath, silk is also reserved. Paper and leather may be colored most satisfactorily by the use of this product. In actual service the fastness to light is quite good, but in a Fadeometer test, the sample turns to an olive tone after 24 hours exposure, but returns to its normal shade after a time.

* Registered Trade Mark.

Chlorantine* Fast Orange T 3 R L L—(CIBA)—this type of reddish direct orange is said to be characterized by a very good fastness to light, coupled with good levelling properties, making it especially adapted for the dyeing of drapery fabrics and upholstery goods of cotton or viscose rayon. It is also useful as a combination color with other "L L" types of Chlorantine Fast Colors.

* Registered Trade Mark.

Chlorantine* Fast Yellow 2 G L L (Patented)—(CIBA)—a new greenish type of direct dyeing yellow said to have excellent fastness to light, together with very good levelling properties. This type surpasses all other Chlorantine Fast Yellow types in light fastness. Under suitable conditions solid shades may be dyed on mixtures of cotton and rayon. Acetate rayons are reserved. Silk in half-silk fabrics is left pure white when dyed from a soap and soda bath.

* Registered Trade Mark.

Chrome Fast Olive R—Synchromate* Olive R (Patented) — (CIBA) — Both names are used for this product, which may be dyed by either the usual after-chrome method or the Synchromate one-bath method. The shade produced by either method is a deep rich olive green, said to possess all the necessary fastness for the dyeing of wool intended for the better grades of men's wear, or military fabrics. Cotton and viscose rayon effects are reserved and acetate rayon only silghtly stained. Chrome Fast Olive R is suited for dyeing wool in all stages of manufacture, however it is not suited for Vigoreux printing.

* Registered Trade Mark.

Chrome Fast Yellow 5 G D—(GENERAL) — is a chrome mordant dyestuff which is of particular interest for color discharges on both vegetable and animal fibers. The product yields a very bright greenish yellow shade said to possess excellent fastness to light and very good fastness to washing.

Chrome Fast Yellow G D—(GENERAL) — like the previously released Chrome Fast Yellow 5 G D, it is recommended by the manufacturers for direct prints and for color discharges on vegetable, animal and artificial fibers as well as on mixed fabrics. The shade is redder than the "5 G D" and is said to possess good fastness to light and washing. By using an addition of Dissolving Salt C a good fixation is obtained in rapid aging of eight minutes.

Chromosol Yellow C—(SANDOZ)—good money value yellow. It is said to be of very good fastness to fulling and to be very well suited for metachrome dyeing, having good light fastness.

Chromoxane Brilliant Violet 5 R—(GENERAL) — a new homogeneous chrome dyestuff of a particularly bright shade, having a comparatively good fastness to light. The product is said to level well and to yield bright clear lilac shades of good fastness to washing, milling, carbonizing and decatizing.

Cibacete* Black B F—(CIBA)—a direct dyeing black for acetate rayon, producing even shades and giving a good exhaust. This type is used for dyeing regular blacks on dress goods and also by garment dyers for re-dyeing. The advantage of having a full black that will cover well in one simple dyeing operation, over the more lengthy process necessary for developed blacks, is quite evident.

* Registered Trade Mark.

Cibacete* Black G L—(CIBA)—this is a direct dyeing black for acetate rayon, producing even shades and exhausting well. It is useful not only as a self shade but in re-dyeing lots that may be off-shade or uneven. The fastness qualities are said to be good toward all influences.

* Registered Trade Mark.

Cibacete* Diazo Black P S new—(CIBA)—this is a water soluble type of diazo black for acetate rayon dyeing. Instead of the dyestuff being a dispersion, it forms a true solution, which is better able to penetrate hard woven fabrics, when dyed on a jig. The development of the direct dyeing is carried out in the usual manner for diazo blacks on acetate rayons, that is, after the diazotization with sodium nitrite and acid, the color is developed with beta hydroxy naphthoic acid in a slightly acid bath at 140° F. The shade of the developed black is a desirable brilliant tone, said to possess excellent fastness to light, washing and perspiration.

* Registered Trade Mark.

Cibacete* Sapphire Blue 4 G (Patented)—(CIBA)—a bright greenish shade of blue for dyeing acetate rayon, which is faster to light and cross-dyeing than the former types G and G F. This type is not suited to printing, nor are the dyeings dischargeable. It is stated that since this type is easily levelled and because of its good fastness to light, it is in favor for the production of combination shades.

* Registered Trade Mark.

Cibagenes*—(CIBA)—the Cibagenes are a series of azoic combinations, which depend for their development upon an acid treatment, followed by a mild alkaline bath. The final shades are identical in every way with the corresponding combinations made from naphthols and diazotized bases, but their merit lies in the method of application. The following types have been put on the market so far: Cibagene Bordeaux R F, Cibagene Violet R E, Cibagene Violet 3 B, Cibagene Blue B R, Cibagene Scarlet 2 G A, Cibagene Orange 3 R A and Cibagene Red 2 B A.

* Registered Trade Mark.

Cibanone* Bordeaux 2 B, Micro Powder — (CIBA) — this represents a new form of the well known type. Micro powders are said to be eminently suitable for use in printing, pigment padding and pigment dyeing in circulating machines.

* Registered Trade Mark.

Cibanone* Golden Orange G, Micro Powder—(CIBA)—this represents a new form of the well known type. Micro powders are said to be eminently suitable for use in pigment padding, pigment dyeing and circulating machines and printing.

* Registered Trade Mark.

Cibanone* Golden Orange 2 R, Micro Powder—(CIBA)—this represents a new form of the well known type. Micro powders are said to be eminently suitable for use in pigment padding, pigment dyeing in circulating machines and for printing.

* Registered Trade Mark.

Cibanone* Navy Blue G A, Micro Powder—(CIBA)—this represents a new form of the well known type. Micro powders are said to be eminently suitable for use in pigment padding, pigment dyeing in circulating machines and for printing.

* Registered Trade Mark.

Cibanone* Red 4 B, Micro Powder—(CIBA)—this represents a new form of the well known type. Micro powders are said to be eminently suitable for use in pigment padding, pigment dyeing in circulating machines and for printing.

* Registered Trade Mark.

Cibanone* Yellow G C, Micro Powder — (CIBA) — this represents a new form of the well known type. Micro powders are said to be eminently suitable for use in pigment padding, pigment dyeing in circulating machines and printing.

* Registered Trade Mark.

D

Developed Brilliant Green 3 G—(NATIONAL)—when diazotized and developed with National Developer Z, yields bright, yellowish green shades said to possess fair fastness to washing, very good fastness to stoving and acid spotting. It is further said to possess excellent solubility, level well and to be suitable for use in all kinds of machines. Furthermore, it leaves acetate rayon effects unstained and discharges readily, particularly on rayon.

"Diagen"* Blue M G D (Patented); **"Diagen" Golden Yellow M R S** (Patented)—(DUPONT)—two new stabilized azoic printing colors for cotton. These colors produce attractive self shades, and since they have the same diazo component, combinations of them will give a wide range of browns that are not sensitive to variations in aging or finishing. "Diagen" Blue M G D is equal in strength and general fastness

properties to "Diagen" Blue M G R (Patented) while the Golden Yellow produces shades of excellent tinctorial value which are said to be much redder than any yellows now on the market.

* Registered Trade Mark.

Diazo Brilliant Scarlet R O L Extra—(GENERAL)—is considerably clearer, yellower and stronger than the "R O A Extra" brand, has equal dischargeability and considerably better washing, water and light fastness.

Diazo Fast Red 8 B L—(GENERAL)—when diazotized and developed with Developer A, produces clear bluish red shades said to be of good fastness properties. The product is particularly recommended by the manufacturers for its very good dischargeability with neutral and alkaline discharge paste; it is also well suited for mixed fabrics of cotton and viscose, giving very good tone-in-tone effects and furthermore, for the dyeing of silk from a weak acetic acid bath.

Diphenyl Bordeaux B X—(GEIGY)—The manufacturer indicates it has outstanding brightness and blueness of shade with good tinctorial power and money value.

Diphenyl Brilliant Violet D B—(GEIGY)—is stated to be an improved type of the familiar Brilliant Violet S, having better working properties on the vegetable fibers and union materials and cleaner acetate rayon effects.

Diphenyl Fast Blue 10 G L—(GEIGY)—the manufacturer claims this to be one of the most outstanding products issued since Solophenyl Fast Blue Green B L, having extreme fastness to light for a greenish blue of this brightness and little affinity for animal fibers and no affinity for acetate rayon. Therefore, besides its usefulness on cotton and rayon fabrics it can be employed advantageously on unions of rayons or cottons and reworked wool:

Diphenyl Fast Blue Red R—(GEIGY)—produces bright, blue shades of red on both animal and vegetable fibers; having definite "pile-up value"; is dischargeable; has little or no affinity for acetate rayon.

Diphenyl Fast Brown 2 R L—(GEIGY)—yields a reddish orange shade of brown of good resistance to light suggested particularly for the dyeing of viscose, cottons, cotton-back mohair, pile and union fabrics. Silk is said to be left comparatively clean.

Diphenyl Fast Orange 3 G L—(GEIGY)—the manufacturers recommend this yellow shade of orange for its excellent resistance to light and its good fastness to acid and alkali when dyed on cotton and rayon.

Diphenyl Fast Orange 3 R L—(GEIGY)—a direct dyeing orange having good resistance to light. Is claimed to be suitable for padding and irregular rayon knit goods dyeing.

Diphenyl Fast Violet C 2 R—(GEIGY)—it is claimed to be outstanding among reddish violets in its fastness to light. It is said to possess, as well, outstanding fastness to hot pressing, calendering or heat.

Diphenyl Garnet R B—(GEIGY)—a cheaper garnet which can be used where no outstanding fastness is required.

Direct Catechine 3 R — (CIBA) — a new type of direct cutch brown, used for dyeing cotton and rayon yarns and pieces. In dyeing, solid shades are obtainable on cotton-rayon mixtures and viscose rayon of variable affinity is reasonably levelled. Acetate rayon is not reserved and dyeings are not dischargeable to white with hydrosulfites.

Direct Orange B C—(CIBA)—a moderately bright direct orange, having an equal affinity for cotton and silk and hence much in favor with dyers of silk and cotton hosiery. The fastness qualities are moderate, but on account of its union dyeing and useful shade, finds extended use.

Du Pont "Naphthanil"* Red 3 G Base—(DUPONT)—a new azoic or ice color which shows fastness properties which are similar to those of Du Pont "Naphthanil" Diazo Red 3 G, but dyeings of this new product are very much stronger tinctorially than those of the stabilized diazo salt. It is said to possess very good fastness to soda ash; cross-dyeing, top-chromed; perspiration, both acid and alkaline; steaming; washing; power laundering without chlorine and washing at 160°F. It also shows good resistance to chlorine bleaching, 2°Bé.; boiling water; washing at the boil and fulling, 1½ hours at 120°F.

* Registered Trade Mark.

E

Erio Chrome Blue 2 G L—(GEIGY) a blue for producing silk white greys. It is claimed that it is unquestionably one of the fastest to light products of this nature.

Erio Chrome Brilliant Orange R L—(GEIGY)—this bright reddish orange is said to be one of the fastest to light oranges. While essentially a top chrome color it dyes well by the Erio Chromal (Meta Chrome) method. Besides normally good finishing properties found in the Erio Chrome Color series this color is said to have excellent resistance to fulling and washing. Erio Chrome Brilliant Orange R L can be discharged with hydrosulfite.

Erio Chrome Brown 3 B—(GEIGY)—a very red shade of brown which can be dyed by all three chrome dyeing methods. It is being recommended by the manufacturers for dyeing silk white piece goods and for its generally good all-around fastness.

Erio Chrome Brown B K L—(GEIGY)—an olive shade of brown closely related to the older Erio Chrome Brown D K L. It is said to possess excellent fastness to light when dyed by any one of the three recognized chrome dyeing methods.

Erio Chrome Flavine 2 G L N—(GEIGY) — a green, bright shade of chrome yellow suggested for producing bright shades of green in combination with fast blues or greens. Is said to have very good fastness to light.

Erio Fast Yellow 6 G—(GEIGY)—one of the greenest of the sulfuric acid dyeing yellows and said to have good fastness to light and to be extremely level dyeing.

F

Fast Acetate Reserve Black E L—(CIBA)—a new type of direct black for cotton or viscose rayon, which will reserve acetate rayons to a perfect white, whether in small effects or in broad stripes and whether bright or delustered.

Fast Light Rubine B L—(NATIONAL)—a new acid red said to be of outstanding fastness to light. It provides a companion product to Fast Light Yellow 2G and Alizarine Sapphire for carpet yarns and ladies' dress goods where combination shades of superior light fastness are required. This color is readily soluble, levels well and produces a bluish shade of red.

Fast Printing Blue R B—(NATIONAL)—possesses the same solubility and keeping qualities as Fast Printing Yellow G, with the added advantage of even better light fastness.

Fast Printing Green G—(NATIONAL)—a companion product to Fast Print-

ing Blue R B, possessing the same fastness to light and solubility in neutral or alkaline printing paste.

Fast Printing Yellow G—(NATIONAL)—a new printing color said to be of good light fastness particularly intended for printing wool, although it can also be used for pure or tin-weighted silk. It is said to possess excellent solubility in either acid or neutral printing paste and shows relatively little tendency to thicken up or scum over on standing.

Fastusol Blue L F B G—(GENERAL)—said to be remarkable for its very good fastness to light, good fastness to alkali, acid and crocking. The new product levels very well and has good solubility; it is suitable for even dyeing of mixed fabrics of cotton and rayon and can be dyed on real silk from an acetic acid bath.

Fastusol Blue L F F B L—(GENERAL)—produces a desirable bright blue shade of a somewhat redder cast as compared with the well-known Fastusol Blue L F F G L. The very good light fastness of this color is in line with the other familiar Blue brands of this range.

Fastusol Green L 6 B L—(GENERAL)—a straight product, producing fine bluish greens said to be of superior fastness to light. The product is said to have very good solubility, to level well and to discharge clear with an alkaline paste; it is well suited for dyeing mixed fabrics of cotton and rayon or wool and spun rayon; acetate rayon remains clear.

Fastusol Red L 4 B L—(GENERAL)—a homogeneous, direct dyestuff, said to be distinguished by its bright shade and very good fastness to light. The color is further said to be easily soluble, level well, possess good fastness to water, which can even be improved by after treatment with Solidogen B and to be easily dischargeable to a clear white.

Fastusol Red L 4 B L stains wool and silk but slightly from a neutral bath and leaves acetate rayon clear.

Fastusol Yellow R K—(GENERAL)—a dyestuff said to be of very good affinity even at very low temperature and without the addition of salt, and therefore of particular interest for the dyeing of spun and staple rayons and of mixed fabrics of these fibers with cotton. The product levels very well and is, therefore, particularly valuable in combination dyeings. It is also well suited for unions of wool and cotton or of silk and cotton.

Formanil Dyes* — (A.A.P.) — a complete range of products after-treated with formaldehyde said to possess excellent fastness to washing, water and perspiration. (It is stated that they have in many instances replaced the more expensive developed colors.)

* Registered Trade Mark.

I

Indanthren Brilliant Scarlet R K Powder Fine for Dyeing—(GENERAL)—a new homogeneous vat dyestuff, which is said to represent the fastest to light bright scarlet available. For this reason it will be of particular interest for the dyeing of cotton piece-goods whenever the brightest possible scarlet shades are required without any sacrifice in degree of fastness to light. It is highly recommended by the manufacturers for use by the pigment padding process on account of its extremely fine state of division. It is, furthermore, recommended for the dyeing of cotton yarn and for the production of pale shades on rayon.

Idanthren Navy Blue B R P Paste—(GENERAL)—should be of particular interest for dyeing on cotton piece-goods and for the dyeing of cotton in its various other forms. The new vat dyestuff is said to be of excellent resistance to water spotting and of very good all around fastness properties. On account of its good solubility, it is well suited for dyeing in machines. It, furthermore, is also of good working properties when applied according to the pigment padding process.

Indanthren Printing Black B G L Suprafix Paste—(GENERAL)—said to be suitable for black or grey prints on account of its high fastness properties. It is said to possess excellent fastness to light and very good fastness to washing and chlorine. The grey shades are absolutely fast to water spotting and hot pressing.

Indanthren Red Brown G R Powder Fine for Dyeing—(GENERAL)—a new addition to the range of Indanthren dyestuffs. It will be of considerable interest in dyeing for the production of various brown and red brown shades possessing excellent all around fastness properties.

Its good solubility and other dyeing properties make it well suitable for machine dyeing and for the pigment padding process, particularly also in combination with those vat dyestuffs which are best dyed according to the IN procedure.

Indigosol Brilliant Violet I 4 R—(CARBIC)—produces clear reddish violet shades said to be of superior fastness to washing, chlorine and light. It is chiefly used for textile printing by the usual methods and for dyeing, especially by the one-bath process.

Indigosol Brown I V D—(CARBIC)—yields violet toned shades of brown said to be of very good fastness to light. It is useful in direct printing and padding according to the methods usually used and suitable as a self color as well as for shading.

L

"Lithosol"* Fast Yellow H L D 40% Powder—(DUPONT)—a new pigment color. "Lithosol" Fast Yellow H L D 40% Powder is of particular interest for the dyeing of paper. It is in the form of a very fine, well-dispersed powder which develops rapidly in the beater and possesses satisfactory dyeing properties. It produces bright greenish shades of yellow which are close to those of "Lithosol" Fast Yellow H V 20% Paste. "Lithosol" Fast Yellow H L D 40% Powder is said to show excellent resistance to light and does not darken on exposure. Due to its excellent dispersing property, this new product is said to be economical and well suited to use in coated papers. A wide range of bright greens may be produced by combinations with Du Pont Paper Blue S or "Lithosol" Fast Green B Powder. "Lithosol" Fast Yellow H L D 40% Powder is particularly suitable for the production of fast-to-light shades on envelope, bag, tire-wrap and similar type stock.

* Registered Trade Mark.

"Luxol"* Fast Blue M B S—(P.A.F.) (DUPONT)—a new spirit soluble color which produces bright, greenish shades of blue. This product is equal in strength to both "Luxol" Fast Blue A R (Patented) and "Luxol" Fast Blue G (Patented), but is much greener and brighter in shade and is faster to light than either of these older types. "Luxol" Fast Blue M B S will be found very useful for making transparent lacquers and spirit

printing ink colors. In alcohol solutions, it will be of interest for coloring leather, paper, celluloid and wood.

* Registered Trade Mark.

M

Metomega Chrome Blue 2 B L Conc.—(SANDOZ)—a new addition to the Sandoz line of Metomega Chrome colors. It is said to possess very good light fastness and is not sensitive to iron and is, therefore, suitable for dyeing in pressure machines for the production of men's shades, especially in slate combinations.

N

Naphtamine Brown B T L—(GENERAL)—said to dye mixed fabrics of cotton and rayon or spun rayon a very uniform shade and is, therefore, recommended by the manufacturers particularly for hosiery dyeing.

Naphthol A S Dispersible — (NATIONAL)—a new addition of a substantive type that disperses rapidly and completely in cold water.

Naphtholate A S—(NATIONAL)—a recent addition of a type affording a convenient and time saving method for preparing material for Naphthol dyeing. Being readily and completely soluble in water, it requires no preliminary boiling with caustic soda to bring it into solution.

Neocotone* Colors (Patented) — (CIBA)—since the formerly noted type, Neocotone Scarlet G, there have been introduced the following: Neocotone Bordeaux X I A, Neocotone Red R, Neocotone Orange O, Neocotone Orange I, Neocotone Blue B. These are all azoic colors in a specially solubilized form, whereby they may be printed on cellulosic fibers in their natural tones, allowing the printer to follow the pattern and registration with certainty. They may be printed beside vat dyes or aniline black. A simple steaming in an ager (not acid), followed by an alkaline wash completes the operation. It is stated that the final shade corresponds in tone and in fastness to the azoic combination from which it was derived and differs from it only in the facility with which the shades are made.

* Registered Trade Mark.

Neogenol Colors — (SANDOZ) — a new form of soluble azo dyes. They are printed in the soluble state and by a simple procedure after a short steaming are converted into insoluble compounds. The outstanding features of these new products are said to be: fastness to light and washing and they can be mixed together to produce the desired shades.

Novochrome Brilliant Green F B—(CARBIC)—a new homogenous dyestuff which produces an exceptionally bright shade of green said to be of good fastness to washing and light. It is suitable for printing cotton, linen and viscose rayon according to the usual methods. Dyed on silk it is said to produce shades of a very high degree of fastness. The color is dischargeable to a pure white.

O

Omega Chrome Brown 3 G L—(SANDOZ)—a new straight brown said to possess exceptionally good light fastness which can be dyed by all chrome methods. Recommended by the makers for use in the manufacture of men's wear woolen and worsted overcoatings or suitings and automobile fabrics. It is said to be fast to fulling, decatizing, stoving, chlorination and cross dyeing. As a self-shade, it is exceptionally useful for producing taupes and tans. The bright shade of this color is retained very well in artificial light. It is stated that because it is one of the fastest acid milling products on the market, it is also recommended for the dyeing of loose fur for melange hats.

Onyxseal Colors—(ONYX)—A dye-containing synthetic printing paste. For direct use in printing colors on all classes of textile fabrics.

P

Pharmasol Brown G R N N—(CARBIC)—gives an attractive yellow shade of brown, not as bluish as the older G N type, and somewhat faster to soaping.

Pharmasol Red G N B—(CARBIC)—a new addition to the Pharmasol series; gives shades slightly bluer than Red G N N and of the same good fastness.

Phenacyl* Developed Black G G N—(PHOENIX)—produces greenish shades of black on acetate rayon fibers when developed with B. O. N. It is said to be non-subliming, fast to gas-fumes and crocking, suitable for use in jigs or on reels.

* Registered Trade Mark.

Phenaldehyde* Navy Blue R N Conc.—(PHOENIX)—a formaldehyde navy said to possess good wash-fastness and to discharge to a pure white. After-treatment with acetic acid and formaldehyde is recommended.

* Registered Trade Mark.

Polar Brilliant Red B N Conc. —(GEIGY)—somewhat yellower in shade than Polar Brilliant Red B, adding one more color to the series of Polar Brilliant colors.

Polar Yellow 5 G N Conc.—(GEIGY)—slightly brighter than Polar Yellow 5 G Conc. Also can be used for printing chlorinated wool, pure dye or tin weighted silk. Said to have good fastness to salt water.

"Polyform"* Colors—(DUPONT)—"Polyform" designates a new range of formaldehyde after-treated direct colors suitable for application to cotton, viscose process rayon and pure silk fabrics.

It is claimed that the "Polyform" colors are noteworthy because of their unusual fastness to washing and their simplified application procedure.

They are said to represent a distinct advancement in the field of wash-fast colors, are especially recommended by the manufacturers for the economical production of ground shades for discharge purposes, require a simple after-treatment with formaldehyde or one less operation for application than the developed colors. It is stated that this interesting group of dyestuffs fulfills a definite need for products of superior wash-fastness and processing economy. The range now includes six products for use alone or in combination, and will be augmented as new colors are developed: "Polyform" Yellow G F (P.A.F.); "Polyform" Orange R F (P.A.F.); "Polyform" Dark Brown 3 B F (P.A.F.); "Polyform" Dark Maroon G F (P.A.F.); "Polyform" Blue B R F (P.A.F.) and "Polyform" Scarlet R F (P.A.F.).

* Registered Trade Mark.

"Ponsol"* Gray R L Paste (Patented) —(DUPONT)—a new vat color that produces neutral to reddish shades of gray, depending on the strength of the dyeing. This product shows the good all around fastness characterized by the vat color group and is said to be particularly resistant toward washing, light, perspiration, hot pressing and cross-dyeing. The stability of the reduced vat of this color is claimed to leave nothing to be desired. It is well suited to Franklin

machine package dyeing and pigment-pad work. "Ponsol" Gray R L Paste is particularly recommended by the manufacturers for shirting shades as it is very resistant to chlorine and power laundering with chlorine.

* Registered Trade Mark.

"Ponsol"* Olive G G L Paste (P.A. F.)—(DUPONT)—a new vat dyestuff which is much greener in shade than "Ponsol" Olive G Double Paste (Patented.). It can be used alone or in combination and will be found particularly valuable for the production of khaki and olive shades on uniform cloths and other service type fabrics which have to withstand severe wear. It is suitable for use on cotton and viscose process rayon in all forms, and is recommended by the manufacturers for application in the Franklin machine or by the pigment-pad method. "Ponsol" Olive G G L Paste is said to possess excellent fastness to light and weather, very good resistance to hot pressing, laundering and washing, and good fastness to perspiration.

* Registered Trade Mark.

"Pontacyl"* Fast Blue G R B Conc.—(DUPONT)—a new type acid blue which is equal in strength to "Pontacyl" Fast Blue G R Conc. but considerably brighter in shade. It is said to possess excellent fastness to acid and water spotting, carbonizing, rubbing and hot pressing, and good fastness to light, alkalies, water and perspiration. Being very soluble and exhausting well, "Pontacyl" Fast Blue G R B Conc. is suitable for machine dyeing. It leaves acetate rayon, cotton and viscose rayon effect threads practically unstained, and is particularly recommended by the manufacturers, for use on tapestry, sweater, weaving and knitting yarns.

* Registered Trade Mark.

S

Silk Discharge Black G B—(CIBA)—this product dyes silk from a neutral or weakly acid bath, giving a very good exhaust. The dyeings are said to have very good fastness to water and good fastness to washing; they discharge to a clear white. The fastness to perspiration is also said to be good. Black ground shades for discharge printing made with this black offer the advantage of savings in time and labor, over developed blacks.

Sulfindone Brilliant Blue 3 B C F—(NATIONAL)—a new addition to the sulfur color line producing on cotton or rayon, bright greenish shades of blue. It is readily soluble, and is said to possess good fastness to light and cross-dyeing, very good fastness to washing, fulling and perspiration and excellent fastness to acids and alkali. It levels well and is particularly valuable for use in pressure machines on raw stock or yarn.

"Sulfogene"* Navy Blue G L R Conc.—(DUPONT)—a new sulfur blue. The fastness properties and general characteristics of this color are very similar to those of the older type, "Sulfogene" Navy Blue G L Concentrated. However, the newer type is redder in shade and also slightly brighter. "Sulfogene" Navy Blue G L R Concentrated is recommended by the manufacturers for dyeing cotton in all stages of manufacture, and for use in the same machines in which the G L type is employed. It is said to present no application difficulties since it levels well and shows good penetration and exhaustion. It is not suitable for discharging or printing.

* Registered Trade Mark.

Supranol Blue G G—(GENERAL)—a new acid blue which is said to combine very good fastness to light with very good fastness to wearing and processing. It levels well from a weakly acid bath and is said to possess a very good fastness to washing, water, perspiration, seawater and stoving. Its fastness to milling, carbonizing and decatizing is claimed to be good. Therefore, it is suitable for slubbing and loose wool. It is stated that the very good fastness to stoving makes the product of value for blankets. The fact that it dyes very well from a neutral bath deserves particular mention.

Synchromate* Blue B 2 G—(CIBA)—a considerably bluer type than the 2 R B but possessing the same character. It may also be dyed by either of the two methods, after-chromed or with Synchromate mordant. The dyeings on wool in all stages of manufacture are said to meet all the requirements of manufacturing or wear.

* Registered Trade Mark.

Synchromate* Blue 2 R B—(CIBA)—a medium reddish toned chrome blue which may be dyed either by the usual method of after-chroming the shade obtained by dyeing in an acid bath, or else by the one-bath method using Synchromate mordant. This dyestuff is adapted for use on wool in all stages of manufacture and is said to meet the requirements of both the manufacturing operations and actual wear.

* Registered Trade Mark.

T

Tinogen Orange 3 R A; Tinogen Scarlet 2 G A; Tinogen Red 2 B A; Tinogen Bordeaux 3 G O D—(GEIGY)—a new group of printing colors permitting application with azo dyestuffs on vegetable fibers without the usual procedure of napthol pre-treatment. Can be developed either in acid ager or special method without ageing with equally good effect.

Tinogenal Red R; Tinogenal Scarlet G; Tinogenal Blue B—(GEIGY)—are water soluble azoic colors for direct application. Have advantage of requiring no "sighting"—the color being distinguishable at all times. They may also be run in patterns with regular vat or chrome colors.

Trisulfon Garnet B R Y Conc.; Chloramine Garnet N R; Chloramine Garnet R S—(SANDOZ)—the last mentioned product is a more soluble type than the old Chloramine Garnet R which has been established for years. Trisulfon Garnet B R Y Conc., is yellower in shade than Trisulfon Garnet B R. Chloramine Garnet N R is an entirely new shade and is the most soluble of all the Garnets. All these products are recommended by the manufacturers for producing deep shades of wine for both cotton and rayon piece goods. The B R Y has the best light fastness and also combines fairly good wash fastness.

V

Vat Printing Black G Double Paste—(NATIONAL)—a new vat printing black said to possess good light fastness and very good fastness to washing, boiling soap, boiling soda, peroxide bleach and chlorine. On cotton or rayon it produces full black shades said to be of excellent fastness to perspiration, acid, alkali and hot pressing.

Visco Blue G S—(SANDOZ)—a new level dyeing blue, greener in tone than Visco Blue R S. It is said to possess good wash fastness and dischargeability and is useful for the production of bright shades on rayon piece goods. Very good acetate rayon white and good fastness to water is claimed. Very little change in hot pressing and when after-treated with bluestone, the light fastness is very good.

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TEXTILE CHEMICALS

A

Abopon Special—(GLYCO)—a white crystalline powder, odorless and non-toxic. It is said to be completely soluble in water. It is used for flameproofing of textiles, paper, cardboard and similar fibrous materials where flexibility and the elimination of "after-glow" are desirable. Particularly recommended by the manufacturers for cotton.

Aero-Tex Products—(CYANAMID)—a line of highly sulfonated oils and softeners manufactured on an entirely new principle. They are said to be distinguished by a remarkable degree of stability to heat, oxidation and rancidity, as well as a high calcium tolerance. They are particularly recommended by the manufacturers as finishing agents for producing highly absorbent finishes; also for use in conjunction with Sanforizing. In addition they are said to possess excellent wetting properties in acid solutions. This line at present consists of: Aero-Tex No. 1—a softener; Aero-Tex No. 2—an oil; Aero-Tex No. 3—an oil; Aero-Tex No. 4—an oil.

Ahcoset*—(A-H)—a synthetic resin finishing material, designed for use with all types of fabrics where a non-slip finish is required. It is said to be especially suitable for rayons, silks, and sheer cotton fabrics. In addition to stabilizing the fabric construction, it is said to impart a soft, mellow hand without any noticeable stiffening effect and without altering shade of white or colored goods.

* Registered Trade Mark.

Ahcovel*—(A-H)—a group of newly developed synthetic substantive softeners. These products are in paste form and go into solution readily. Produced from a new synthetic base, they are said to combine outstanding stability to light and heat with a high degree of permanence. Ahcovel A (the first product to be offered), is said to produce a soft, velvety finish on cotton, rayon, linen, jute, etc. and may be applied in the quetsch, mangle, or dye-beck.

* Registered Trade Mark.

Albatex L—(CIBA)—a fine, white, non-hygroscopic powder said to be easily soluble and with no unpleasant odor or effect. It is specifically designed for the prevention of tendering of wool, where hydrosulfite is used, for instance in discharge pastes, or in stripping. The tendering is caused by the decomposition of the hydrosulfite into sulfides and sulfohydrates; and the prevention of their formation also assures purer whites and clearer colored discharge effects.

Amanol* — (A.A.P.) — a fatty sulfonated alcohol dyeing assistant particularly recommended by the manufacturers for scouring and washing.

* Registered Trade Mark.

Amanol C*—(A.A.P.)—a fatty sulfonated alcohol dyeing assistant serving principally as a wetting out and levelling agent for all textile fibers.

* Registered Trade Mark.

Aminohydroxy Compounds — (COMMERCIAL) — compounds such as 2-amino-2-methyl-1-propanol; 2-amino-2-methyl-1; 3-propanediol and trimethylol aminomethane. These materials, when mixed with a free fatty acid such as oleic or stearic, form stable non-darkening soaps which are claimed to be excellent emulsifying agents and detergents. An aminoalcohol, glycol and triol are available at present. These vary from a low boiling liquid with high vapor pressure to a solid with relatively high melting point. All of these amines and their soaps are soluble in water. Their solubilities in oils tend to decrease as the number of hydroxyl groups present in the molecule increases. The use of these products in the form of their soaps in textile specialties and for such purposes as penetrating agents and the like is said to be worthy of investigation.

Appramine (Patent applied for)—(WARWICK)—a new series of cation active softeners of semi-permanent character. A whole series of compounds is now available with a wide range of applications for softening and finishing.

Aqua Kal — (KALI) — a new type penetrator which is said to be fast and very efficient.

Arctic Syntex "M"—(COLGATE)—one of the newer, synthetic wetting out, scouring and detergent agents. It is said to be excellent for scouring, wetting and dispersing in hard waters or solutions of metal salts. It is further said that it is stable in acid solutions as well as light and air and does not develop off-odors if left in fabrics. Suggested for print washing, rayon scour, wool yarn scour, emulsifying and dispersing.

"Avitex"* V S—(DUPONT)—a special type of fatty alcohol sulfate finishing agent, designed to give a finish with a very smooth surface and a fairly full hand. It is said to impart an appearance and feel of quality to cloth and improve the brightness of whites on prints. It is also said to increase the closeness of the face of the cloth and decrease the oiliness, thus producing a greater resistance to soiling. "Avitex" V S is further said to show extreme resistance to the calcium and magnesium salts found in hard water, and to be stable in both acid and alkaline solutions. It is of special interest on many types of spun rayon materials and continuous filament rayon fabrics such as flat crepes, twills, serges, taffetas, etc.

* Registered Trade Mark.

C

Catylon B—(HART)—a cation-active softening agent which is said to be permanent in its effects. It is used principally for the softening of acetate rayon, and Bemberg rayon fabrics and imparts a full, well-rounded supple hand. Since Catylon B is substantive in its action, small quantities can be used in the last rinse after dyeing, and the softening effect is said to be as permanent as the dyestuff itself. Catylon B is unaffected by hard water and may be used in the presence of metallic salts, such as calcium, magnesium or aluminum.

Ceranine HC new — (SANDOZ) — a new development in the Ceranine products for softening cotton and rayon. It is stated that the product does not affect the fastness to light in any way. Ceranine H C New is said to produce a very soft pleasant hand combined with good draping qualities; no stickiness and no odor.

Cerol W E—(SANDOZ)—a durable waterproof finish which will withstand several washings. The product necessitates only normal dyehouse equipment for its application and the process is simple and can be very easily governed.

Comco Finish S P — (COMMONWEALTH)—a new resin finish suitable for cotton and spun rayon fibers. Also suitable for mixed fabrics and back filling, producing a semi-permanent finish.

Cominol R—(COMMONWEALTH)—a softening agent for acetate rayon, viscose rayon and cotton, said to produce extreme softness.

Culofix—(ARKANSAS)—is said to be highly efficient for treating cotton or rayon fabrics dyed with direct colors to increase the fastness to water and bleeding. It is applied to the fabric in a water bath as the final wet process after the pieces have been rinsed after dyeing.

D

Dehagen I I—(CARBIC)—said to be an excellent protective agent for those Indigosols susceptible to over oxidation. It is also used to advantage in aniline black printing, preventing tendering and greening of the black.

Delustrant — (KALI) — a hosiery finish.

Developene—(KALI)—a finishing oil.

Dichlorisopropyl Ether—(CARBIDE)—$ClCH_2(CH_3)CHOCH(CH_3)CH_2Cl$, a colorless liquid boiling at 187.3° C. that can be used in spotting agents and cleaning solutions; for it is said to be a good solvent and extractant for fats, waxes, and greases.

Diethyl "Carbitol" — (CARBIDE) — $(C_2H_5OC_2H')_2O$, a colorless, almost odorless liquid boiling at 187.9° C., and said to be a powerful mutual solvent for many organic compounds. When added to colloidal systems, such as detergents and wetting agents of limited water solubility, it permits dilution with water without gelling or clouding. Since it is composed entirely of ether and hydrocarbon groups, it is chemically inert and is said to make an excellent high-boiling reaction medium.

Diethyl "Cellosolve"—(CARBIDE)—$C_2H_5OCH_2CH_2OC_2H_5$, when added to colloidal systems, such as detergents and wetting agents of limited water solubility, permits dilution with water without gelling or clouding. It is a colorless liquid boiling at 121.4° C., and can be used as an inert reaction medium.

Dipropylene Glycol — (CARBIDE) — $(CH_3CHOHCH_2)_2O$, a high-boiling, odorless coupling agent or mutual solvent for normally immiscible liquid systems, and will also help to soften fibers. It absorbs moisture from the air, but has only about one-half of the hygroscopicity of diethylene glycol.

Dullit M G—(GENERAL)—is a new agent for the delustering of mixed fabrics of wool, spun or glossy rayon. The dulling agent goes mainly on the rayon and sparingly on the wool making it possible to deluster mixed fabrics to resemble pure wool in appearance. Dullit M G may be applied on the winch, jig or pad.

Dullit S—(GENERAL)—a new, substantive delustering agent which is said to be fast to rinsing and imparts not only an even matt effect, but also a very soft and full handle to the materials treated. It is particularly suitable for rayon and staple fiber materials but may also be used for silk.

The product is not sensitive to hard water. As the product has a softening effect, it is not necessary to apply softening agents to the bath.

"Duponol"* E S Paste (Patented)—(DUPONT)—a fatty alcohol sulfate which is said to dissolve readily in hot or cold water to form heavy-bodied soap-like solutions with excellent detergent properties. It is claimed to be especially valuable for the removal of solid soil and loose dyestuff particles to produce brighter fabrics. "Duponol" E S Paste also imparts a pleasing hand to the fabric.

* Registered Trade Mark.

"Duponol"* P C—(DUPONT)—a purified sodium lauryl sulfate developed for use in pharmaceutical preparations and cosmetic formulations.

* Registered Trade Mark.

E

Elastic Finish — (KALI) — a splash proof hosiery finish.

Emulsifier 1424 — (CIBA) — a new emulsifying agent, soluble in solvents, oils, waxes, etc., which is said to be particularly efficient even in small quantities for the formation of stable emulsions. No alkali or oleic or other fatty acid need be added to produce the emulsions. Emulsifier 1424 is particularly adapted for the production of water in oil emulsions.

Este Delustrant E K—(GENERAL)—a new delustrant for delustering knitted or woven rayon material on the pad. It does not require any addition. The product is simply pasted up with warm water and applied at 85-95°F.

The woven or knitted materials finished with Este Delustrant E K are said to show a deep matt effect and an extremely soft, agreeable handle.

Esterol V—(HART)—a highly sulfonated tallow. It is used in the finishing of all types of cotton and rayon fabrics and is said to impart a full-bodied rich hand. It is stated that because of its high sulfonation, the finish penetrates the goods thoroughly and rapidly in contra-distinction to the surface finish obtained with ordinary sulfonated tallows. Esterol V will not develop a rancid odor or go off color regardless of how long the goods treated with it are stored.

Ethyl Phenyl Ethanolamine—(CARBIDE)—$C_6H_5N(C_2H_5)CH_2CH_2OH$, like phenyl ethanolamine, can be used to make dyestuffs which are said to be especially promising for acetate rayons. Its boiling point at 740 mm. is 268° C., and its solubility by weight in water is 0.50 per cent.

F

Fiba Perm-H—(ONYX)—Synthetic resin complex. It is said to impart to silk hosiery a permanent finishing and delustering action.

Finish B G—(CIBA)—an addition to the range of cation active softening agents for the production of a full and supple body in combination with the maximum softness. It is in the form of a creamy tan paste and is easily diluted for use.

Flexo Wax C—(GLYCO)—a sticky wax said to have excellent adhesive properties. It has a melting point of 63°-74° C. and is insoluble in water. Being amorphous (non-crystalline) it is recommended by the manufacturers for waterproofing purposes. Because of its adhesive property it is useful for all types of adhesion and laminating work.

G

Genotex A—(ARKANSAS)—offered for producing increased body and weight in spun rayon. It is stated that it is used in the finishing bath in conjunction with *Permolite* to produce a permanent finish on filament and spun rayon and prevent slippage of the filling threads on low-count rayon.

H

Hartex Slipproof Finish No. 242—(HART)—a clear amber liquid composed of solubilized resins. Slipproof Finish No. 242 is used in the finishing of low-end rayon fabrics to prevent any distortion caused by the sliding or slippage of the yarns. It is also said to impart a very desirable bodied finish to the fabric without any appreciable stiffening or harshness. Slipproof Finish No. 242 is compatible with the usual finishing agents and may be used in conjunction with sulfonated oils, soluble waxes, gums, etc.

Hydrocide — (ROHM) — Rohm & Haas Company has developed a germicide and fungicide, which is offered under this trade name. Hydrocide has a phenolic coefficient of 21, and is said to be highly effective in low concentrations. This agent is said to be unique in its high solubility in water, its freedom from odor, and its non-caustic properties.

Hydrolux (Pat. applied for)—(WARWICK)—a new type of printing assistant replacing hydro-sulfate up to 50 per cent. The product acts as a stabilizer for printing pastes causing the breakdown of hydrosulfite to slow down. Increased color values and better running qualities on the printing machines, also quicker ageing as well as better control of oxidization in the boxes before ageing is said to be achieved.

Hydroxcene—(KALI)—a one piece treatment for rayon crepes.

Hydroxol F—(KALI)—a boil off oil for hosiery.

Hydroxy Boil-Off Oil (KALI) — a boil off oil for hosiery.

Hydroxy Chalked Finish D—(KALI)—a finish for dulling dark colored goods.

Hydroxy Chalked Finish W—(KALI)—a finish for dulling light colored goods.

Hydroxy Dry Size No. 3—(KALI)—a size for rayon and acetate rayon.

Hydroxy Finish 100 — (KALI) — a finish.

Hydroxy Finish 0—(KALI)—a finish.

Hydroxy Finishing Oil C 6—(KALI)—a finishing oil which may be used on hosiery.

Hydroxy Finishing Oil 66—(KALI)—a finishing oil.

Hydroxy French Size — (KALI) — a size for rayon and acetate rayon.

Hydroxy Penetrator 52—(KALI)—a penetrant. It is a cresylic type which is said to be very fast and to produce exceptionally even dyeing. It may also be used as an anti-mildew.

Hydroxy Penetrator 52 H—(KALI)—a penetrant which is soluble only in concentrated caustic and is used as a penetrator in mercerizing.

Hydroxy Rayspinol — (KALI) — for oiling cut rayon for spinning.

Hydroxy Sulfonated Castor Oil—(KALI)—a finishing oil.

Hydroxy Sulfonated Olive—(KALI)—a finishing oil.

Hydroxyethyl Ethylene Diamine — (CARBIDE) — $NH_2CH_2CH_2NHCH_2CH_2OH$, constitutes a novel raw material of interest to producers of textile compounds and dyestuffs, as it embodies the chemical reactivity of alcohols, primary amines, and secondary amines. This water-soluble compound is a hygroscopic liquid that boils at 243.7° C. It has a medium viscosity and a mildly ammoniacal odor.

Hygrolit* Compound T C — (HYGROLIT)—for treatment of cotton yarn used in tire cord. It decreases the elongation or stretch. It is stated that treated cord, when reduced to the bone dry state, retains a surprisingly high percentage of its normal tensile strength. The filaments, which stick out from the yarn, are smoothed down thus decreasing the internal friction encountered under actual high temperature conditions.

* Registered Trade Mark.

I

Intracol — (SYNTHETIC) — a new cation type of compound which is said to have the unusual property of having a real affinity for the textile fiber, like a dyestuff but at the same time being colorless. It is this action which invisibly dyes the fiber imparting lubricant and softening properties permanently. Has the properties of imparting a definite softening action on rayon and cotton materials; it is also effective when used in small amounts in the final rinse. Its action is claimed to be permanent.

Invadine D—(CIBA)—this new material, which is a cream colored, easily dissolved powder, is a penetrating and levelling agent for acid and chrome colors, that works on a new principle, i. e. penetration by retarding dyestuff exhaust. It is not recommended for speedy wetting, but has been found of decided value in the dyeing of woolen piece goods for men's wear or for hat felts, or wherever skittery shades are to be avoided.

K

Kalitol H—(KALI)—a boil-off oil for hosiery. It is a concentrated dry powder and requires only a low percentage.

Kalizine—(KALI)—a hosiery finish.

Kalpinol—(KALI)—a pine oil penetrant for use in dyeing raw stock, skein and piece goods.

L

Lauramine—(LAUREL)— a new organic stable finish for silk hosiery, cotton and rayon fabrics for which the manufacturer claims unusual softening value. It is said to produce a good full hand and works in combination with all types of finishing compounds.

Laureltex No. 340—(LAUREL)—Improved Transfer Remover. Completely and quickly removes transfer from silk hosiery prior to stripping and re-dyeing. Will also remove finishing compounds, it is said.

Levana F—(SANDOZ)—an improved protecting agent said to possess also very marked level dyeing properties to be used when dyeing animal fibers. It is said to be especially beneficial for goods with raised designs to protect the appearance of the design (boucle materials) or for open weaves, in which case Levana prevents shrinking and helps to obtain the required width in finishing. Its level dyeing action is very marked for acid colors in neutral and acid baths and for chrome colors.

Lucidol — (LUCIDOL) — a granular form of benzoyl peroxide, which can be broken down into a smooth paste with benzyl acetate or other solvents, and then mixed with printing gum. The resulting paste is printed on mixed fabrics containing cellulose acetate and a subsequent heat treatment results in a burn-out of the acetate fibers only from the printed portions. The resulting burnt-out material, still a mixture, can be cross-dyed or printed to obtain a variety of effects.

Luperox—(LUCIDOL)—a new paste which contains 45 per cent finely dispersed benzoyl peroxide. Luperox can be mixed readily with printing gum, and the resulting paste can be used directly in burn-out printing on mixed fabrics containing cellulose acetate. In this process the acetate fibers are destroyed in a subsequent steaming operation. Many unusual designs are made possible by this process. It is stated that Luperox offers the advantages of ease of application as well as a saving in cost since no solvent is required.

Lupomin — (WOLF) — a new cation active softening agent for textiles suitable for use on cotton, linen, rayons, silk, wool and mixed fibers. It is stated that it has been found of particular advantage for softening crepe fabrics containing acetate rayon fibers. Its use in a very small quantity is said to give a supple and smooth hand. Its use is further said to insure: lubricated yarn; drapery fabrics; odorless finish; strong yarn; bright shades; bright print colors; fast colored discharges; no bronzing of sulfur colors; no bleeding, no crocking; no mark-off on wet pressing.

Luposec—(WOLF)—a modern waterproofing agent intended for use in giving repellency to all types of textile fibers in a single bath process and is said to be equally effective on cotton, wool, silk, rayon, cellulose acetate rayon, linen, etc. It is stated that Luposec is economical as water resistance is obtained by the use of low concentrations. It may be mixed with other finishing compounds such as gelatines, gums, starches, dextrines, etc., and is said to have a minimum effect on dyed shades and to make the colors faster to rubbing, etc., after treatment. It is stated that it leaves white goods colorless and odorless and on standing the goods develop a full, round, mellow hand. The finish obtained is said to possess excellent spot resisting and water repellent properties on all types of textiles. It is further said that the finish is resistant to sun and weathering as well as to mild laundering and dry cleaning.

M

Methyl Oleate; Methyl Stearate—(GLYCO)—These products are suggested for use as follows:—Plasticizer for various kinds of coatings; cleaning and polishing compounds, carrier for dyes; molding and special lubricants; cosmetic lipsticks; stencil sheets; carbon paper; typewriter ribbons; duplicating and stamping inks; non-drying compositions; softener for leather, rubber, waxes, resins, etc., varnish removers.

"Modinal"* E S Paste (Patented)—(DUPONT) — a fatty alcohol sulfate which is said to dissolve readily in hot or cold water to form heavy-bodied soap-like solutions with excellent detergent properties. It is claimed to be specially valuable for the removal of solid soil and loose dyestuff particles to produce brighter fabrics. "Modinal" E S paste also imparts a pleasing hand to the fabric.

* Registered Trade Mark.

Modinal E S—(P & G)—a detergent intended for use in scouring and wetting out and as a dyeing assistant and emulsifying agent. It is a sodium sulfate of technical oleyl alcohol.

Mulsor — (SYNTHETIC) — an emulsifier, a synthetic organic compound of uniform composition, said to be miscible in all proportions with all petroleum oil fractions. It is further said to be stable to heat and light; is an amber colored liquid of S. G. .097, and free flowing at ordinary temperatures. Low temperatures cause a clouding which in no way affects its usefulness; clouding disappears on slight warming. Mulsor is said to be neutral, contains no oleates, phenols or metallic elements.

N

N. C. F. Finish—(ONYX)—a synthetic resin. Useful either alone or in conjunction with other finishing agents in securing permanent finishing effects.

Nilo M O — (SANDOZ) — a highly concentrated emulsifying agent for all types of mineral oil. No machinery is necessary to prepare the emulsions which are said to be exceptionally stable over a wide pH range. Emulsions prepared with Nilo M O are easily removable after long storing.

No-Odorol R N T—(CYANAMID)—a sulfonated vegetable oil similar in its characteristics to sulfonated olive oil, highly recommended by the manufacturers for finishing fine cottons and rayons. It is distinguished by its clarity and freedom from separation of solid fatty matter. It is said to impart a high degree of softness to fabrics, with excellent draping qualities.

Nullapon A and Nullapon B—(GENERAL)—are two organic water softeners, which, it is said, not only prevent the formation of lime soap but also re-dissolve lime soap and difficultly soluble compounds of metal soaps, carbonates and hydroxides precipitated on the fibers. In addition to this, Nullapon B is especially used for the removal of copper or manganese from material to be vulcanized and for clearing the yellowish tint caused by iron on white goods.

O

Onyxsan W No. 20 (Patent applied for) — (ONYX) — an improved cationic finishing agent. Imparts permanent softening action to cellulosic materials.

Onyxseal White — (ONYX) — a pigment-containing synthetic printing paste. For direct use in printing whites on all classes of textile fabrics.

P

Palm Blend Soap—(COLGATE)—a blended palm oil and tallow soap, specially desirable for fulling and scouring medium weight piece goods. Contains 88 per cent pure soap. A companion product of Miltex Palm Soap, made of pure palm oil. Both products available in flake and bulk form.

Pentogen C—(HART)—Pentogen C is claimed to be a superior terpene wetting-out, penetrating, leveling and dispersing agent especially recommended by the manufacturers for kier boiling, boiling-off, package dyeing, etc. It is highly concentrated, containing more than 90 per cent of active ingredients. The outstanding feature of Pentogen C is said to be that it retains its penetrating qualities even after prolonged boiling and thereby insures maximum efficiency throughout the entire processing.

Permahose Finish — (COMMONWEALTH)—a new hosiery finish of the resin type.

Permolite — (ARKANSAS) — a synthetic resin offered for finishing filament or spun rayon fabrics. It is said to reduce shrinkage, prevent slippage and to be a general stabilizer of all fabrics. It is further said to produce a soft, full and improved finish on cotton, and when used in conjunction with *Genotex A*, imparts a permanent finish to rayon and cotton fabrics. It produces a soft, full finish on spun rayon.

Peroxol—(KALI)—used as a penetrant in peroxide bleaching. It is said to possess the properties of cleaning the material and evening the bleach.

Persan (Patent applied for)—(WARWICK)—a permanent fabric finish which is said to give durable antiseptic qualities to a fabric. The product is applicable to a wide range of fabrics. Application is very simple as no high curing temperature is necessary. The product is sold through the Impregnole Corporation, a subsidiary of Warwick Chemical Company.

Phenyl Diethanolamine—(CARBIDE) — $C_6H_5N(CH_2CH_2OH)_2$ — as a coupling agent with diazo compounds produces dyes which are readily applied to acetate rayons, and which are said to crock less than dyes made from dimethyl aniline. Phenyl diethanolamine is a high boiling compound and has many possibilities for use as a tertiary amine.

Phenyl Ethanolamine—(CARBIDE)—$C_6H_5NH(CH_2CH_2)OH$, useful in the synthesis of azo dyes made by coupling this compound with various diazo compounds. Phenyl ethanolamine undergoes the characteristic reactions of a secondary amine and is worthy of investigating for other intermediate uses.

R

Rapidase — (WALLERSTEIN) — desizing and degumming agent for removal of starches and proteins. It is a standardized mixture containing amylolytic and proteolytic enzymes.

Repelon M F S—(HART)—Repelon M F S is said to be an unusual hosiery finish that imparts to the stocking excellent spot proofing action and at the same time gives the much desired scroopy handle. It is further said that it also tends to straighten the wales, tighten the stitch and correct any sleaze. The proper use of Repelon M F S will produce the much desired crepe finish on low gauge hosiery.

Resitex*—(HERCULES)—A thermoplastic resin which is designed for a slip-proof finish on rayon fabrics. It can be easily modified to produce any desired hand in the goods. Resitex can be used with regular equipment of the finishing plant as no curing under high heat is necessary. It is compatible with gums, starches, softeners and finishing oils, and is said to be resistant to dry cleaning fluids and standard laundry practice for rayon fabrics.

* Registered Trade Mark.

Resopan—(SANDOZ) — an improved scouring compound of interest for scouring of wool at any stage. It is said to combine high detergent power with a lubricating action leaving the goods in a soft and natural condition. Resopan is active on its own or in combination with alkali and is said to possess very good all round stability.

RHoplexes — (ROHM) — The list of synthetic resin emulsions which is manufactured under this name has been considerably extended. The newest members are RHoplex W-E50, RHoplex W-G20, RHoplex W-C11, RHoplex W-D12, RHoplex W-66, etc. The entire range of RHoplexes has been considerably improved by this extension, and these chemicals provide for permanently finishing all types and grades of textile fibers and fabrics.

RHotexes — (ROHM) — during the past year Rohm & Haas Company developed three water soluble synthetic thickeners which are now offered under the trade names RHotex A-5F, A-20 and A-12. These materials are highly recommended by the manufacturers as sizing agents, print paste thickeners, and finishes for use in wetting textile fabrics.

S

Serizyme—(WALLERSTEIN)—used for desizing acetate rayon fabrics and

others containing protein sizing. It is also used in a patented process in the treatment of raw silk to facilitate subsequent degumming. It is a proteolytic enzyme.

Silk-O-Fast F. F.—(ONYX)—a polypeptide resin. Useful in textile finishing on all types of fabric. The effects are said to be permanent to washing.

Simol T—(GEIGY)—Simol T is a one bath water repellent for all textile materials. It can be applied on the quetsch, jig or dye box. It is stated it does not impart color or odor to the fabric, and does not change the hand appreciably. It will also improve the finish in hosiery, giving it more "set."

Softener B F — (CYANAMID) — a highly stabilized softener said to possess remarkable stability to heat. It is stated that fabrics processed with Softener B F will not yellow under the most adverse conditions and will retain their whiteness over long periods of time.

Solamine—(LAUREL)—a new cation active softener of the amine type designed for finishing cotton and rayon piece goods. It can be used on dyed or bleached goods without discoloration.

Solivol—(KALI)—a finishing oil.

Solvadine G—(CIBA)—a new form of the highly efficient and stable wetting agent Solvadine N C Conc., now offered in flake form, which is said to provide improved wetting speed and emulsifying and detergent properties.

Soromine B S—(GENERAL)—a new softener said to produce very good smoothing and filling effects. Aside from this, when applied in small quantities with a little acetic acid, it is also said to improve the fastness to water and to a certain degree, the fastness to perspiration of direct dyeings.

Sulfanole C P (Patent applied for)—(WARWICK)—a sister product to Sulfanole P B, a new synthetic detergent, particularly adapted to rayon boil-off.

Sulfoko—(KALI)—an oil used with gelatine for rayon crepe treatments.

Synthetic Resin Type Finishes — (KALI)—finishes which are also applicable to hosiery.

T

Tetraethylene Pentamine — (CARBIDE) — $NH_2(CH_2CH_2NH)_3CH_2CH_2NH_2$ — a somewhat viscous, hygroscopic liquid at 333° C., the lowest priced of the polyethylene amines. It is stated that it is completely soluble in water and most organic solvents, and readily dissolves various dyes. It can be used to saponify acidic materials, such as fatty acids, to form soaps.

Tinophen C — (GEIGY) — a wetting out agent for mercerizing liquids, said to be particularly suitable if mercerizing is done in the raw, where a quick and uniform penetration is essential.

Tinopole Oil B H—(GEIGY)—it is reported to be a stable dyeing or finishing oil having special affinity for wool imparting a softness to raw stock, skein or piece directly in the acid dyeing bath which is not materially affected in subsequent washings. Where heavy Epsom salts finish is required on cotton it retards recrystallization and imparts desirable softness.

Titafins — (TITAN) — for softening rayons, silk, cellulose fibers, cotton and mixed fabrics. The product is pure white, cation substantive and said to be stainless. It is stated that it attaches and exhausts itself on all fibers and gives a distinctive and superior softness and that fabrics show no ill effects after many months of repeated laundering and dry cleaning. It is said that such treatment enhances the hand and brilliance of color and perspiration discoloration is eliminated. It is further said: that it is effective with all types of dyestuffs as it increases the brilliancy of dyed shades, that when used as a print wash it produces brilliance of shade, depth of color, fastens direct colors to water and does not go rancid. It requires no additional equipment for use. It is produced in the following forms: Titafin R C T, for rayon, silk, spun rayon and acetate rayon; Titafin T C, for cotton, linens and other vegetable fibers; Titafin K T, for kier boiling; Titafin P T, for combining with R C T and T C for fuller hand.

Triglycol Dichloride—(CARBIDE)—$Cl(C_2H_4O)_2C_2H_4Cl$—a colorless water insoluble, high-boiling (241.3° C.) liquid, useful as both a solvent and extractant because of its excellent dissolving power for oils and hydrocarbons.

Triton K-12—(ROHM)—is an aqueous solution of an extremely stable tetra-substituted ammonium salt. This cation active chemical is said to be unique in its ability to act as a powerful dispersant and softener in strongly acid, neutral, or alkaline solutions. As a unique finishing and softening agent, the manufacturers particularly recommended Triton K-12, since it offers an entirely new approach to these textile problems.

Triton Scour — (ROHM) — this is claimed to be a very powerful wetting agent and detergent, which is effective in acid, neutral or alkaline solutions, and which is proof against hard water. This Triton Scour is said to be one of the most powerful dispersants of grease, oil and solid soil which Rohm & Haas have tested in their laboratory. It is highly recommended by the manufacturers for all textile applications.

Triton W-30—(ROHM)—during the past year this general wetting and penetrating agent has been considerably improved. W-30 is highly recommended by the manufacturers for use in the desizing, dyeing, finishing, printing, scouring, shrinking, sizing, stripping and washing of textile fabrics.

U

Unipan A—(CARBIC)—a new auxiliary product particularly useful in the dyeing of Indigosol colors by the one bath method; it is said to promote level dyeing, penetration and also act as a protective agent against over-oxidation.

Unitex — (COMMONWEALTH) — a textile auxiliary said to possess excellent scouring, washing, wetting and levelling properties, and to be stable in acid and alkaline solutions and not affected by hard water.

Universal Finish — (COMMONWEALTH)—a new resin finish especially suited for rayon and acetate finishing to replace oils and gums, recommended where crease-proofing and slip reducing qualities are desired.

W

Wetsit—(WOLF)—a synthetic wetting agent to reduce surface tension and increase penetration. It is stated that it maintains efficiency in great dilutions and is stable to all conditions. It is said that it will save time in processing, will reduce the cost of detergents and will assure an improved and uniform finishing product. In addition to its wetting-out properties it is said to possess emulsifying, penetrating, dispersing and detergent properties.

X

Xynomine* — (ONYX) — a sulfated fatty acid condensate. Said to be a potent detergent, wetting, penetrating and emulsifying agent. Stable under all conditions of acidity and alkalinity. A general utility auxiliary for use in all textile operations.

* Registered Trade Mark.

Xynomine* B. M. Powder—(ONYX)—a phospho sulfated synthetic ester. An effective detergent and water softening agent. It is said to possess excellent stability to acidity and alkalinity. Uses: Primarily designed for scouring and rinsing. Valuable bleach assistant.

* Registered Trade Mark.

Xynomine* Degum — (ONYX) — a fatty acid condensate, neutralized and buffered to pH 10. A silk hosiery degumming agent, particularly for the one-bath method. It is said to show minimal effect on fibroin; to be unaffected by hard water, and to disperse and prevent reduction of sulfocyanine blues and blacks in degumming liquor.

* Registered Trade Mark.

EQUIPMENT

Wet Processing Machinery—Laboratory Equipment

Ace Automatic Burette — (ACE) — Pyrex brand glass provides a very handy acid measuring device and fits all standard five pint screw cap acid bottles.

Ace Automatic Overflow Burettes—(ACE)—suitable for acid, neutral or alkali solutions. Both stopcock and joint which fit into bottle are interchangeable. Pyrex brand glass throughout.

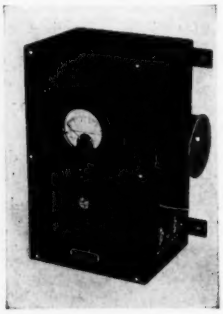
Ace Automatic Reflux Ratio Still Head—(ACE)—this device permits taking of automatic "cuts" in any distilling operation. By merely setting the ratio desired on an electric clock any predetermined refluxing can be obtained. It is a great time saver.

Ace Fiber Glass Filter Discs—(ACE)—American made sintered glass filters produced from Pyrex glass. This is an American product which heretofore could only be obtained from foreign sources. It is said to provide rugged structure, complete visibility, resistance to corrosive solutions and can be dried to constant weight. U. S. Patent No. 2,130,170.

Ace Spherical Joints—(ACE)—an entirely new development in glass-to-glass connection. Particularly adaptable for use with alkali solution because they are flexible, non-freezing, and interchangeable. Adapters are available so that spherical joints can be used with T joint equipment.

Ace Trubore Tubes — (ACE) — constant bore tubes made of Pyrex brand glass. The inside diameter is held to a tolerance plus or minus 0.01 mm. (0.0004"). This is an American development making available, for the first time, constant bore tubes of American manufacture.

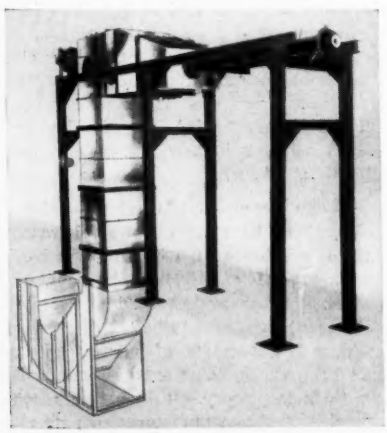
D W Automatic Distilled Water and Condensate Checker—(INDUSTRIAL)—this checker is designed to measure the conductivity of water or other electrolytes continuously. It is said that the conductivity of distilled water or condensate is an excellent measure of its purity. The presence in distilled water of one part per million of chloride ion will increase its conductivity about fifty per cent. Any increase in conductivity above normal results in the operation of an alarm signal, electric valve or any other desired control apparatus.



D. W. Checker

Continuous Bleaching Machine—(TEXTILE—[in cooperation with E. I. du Pont de Nemours & Co., Inc., (The R. & H. Chemicals Dept.) Wilmington, Del. and Niagara Falls, N. Y.] a new stainless steel continuous bleaching machine which is being used in connection with the new Du Pont peroxide bleaching process. The unit consists of a specially designed "J" shaped equipment fabricated from stainless steel on the sections which actually come in contact with the fabric and chemicals. It contains a special horizontal pre-heating tube and "J" shaped body with bonnet or hopper containing the piling mechanism to pile the fabric in the rope form, with a traverse motion so that the fabric is loaded and retained in the machine for a predetermined period in such a manner that the bleached material may be removed continuously.

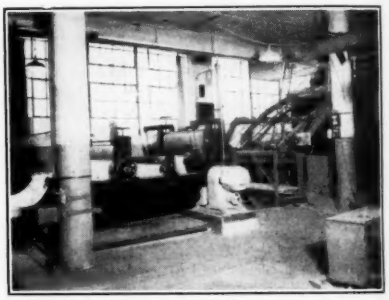
Several practical installations have already been made in New England finishing plants. The results obtained to date indicate that equipment of the type illustrated when operated with the proper formula of peroxide bleaching ingredients and simple pre-treatment is capable of bleaching average weight cotton fabrics at the rate of 5,000 to 6,000 yds. per hour in a continuous delivery. It is claimed that the operation of the new process and equipment on many classes of goods will eliminate the use of the well known kier boil which makes it necessary to retain fabric from 20 to 30 hours in a pressure vessel and at the same time obtain full commercial white and the proper degree of absorbency. By the use of this equipment on the part of many bleaching and finishing plants it is hoped to simplify the conventional type of bleaching plant layout both as to the possible elimination of kiers and rearrangement of after-treatment so far as washing, etc., are concerned.



Continuous Bleaching Machine

"Fleet Line" Carbonizing Range—(RIGGS)—this new equipment is said to be characterized by increased production in a relatively small space, uniform quality of product and reduced cost of upkeep, which results are made possible by the following features:

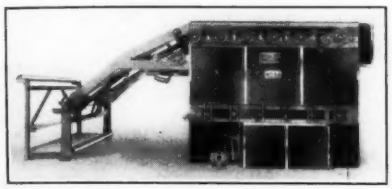
A solid metal tank with a one-piece vulcanized rubber lining, which means a lifetime job and absence of the leakage and repairs which occur in wooden tanks. This tank also has extra large capacity and requires bringing up to strength only twice a day on ordinary work. Three sets of squeeze rolls which make for greater acid penetration, the last set of rolls being extra heavy for extraction and having no vacuum slot. All immersion rolls are rubber covered. A circulating system (not shown in photo), consisting of an outside, elevated rubber lined tank into which all acid additions are made. A motor driven lead pump, with rubber hose, draws the liquor from the main tank, discharges it into the auxiliary tank, and returns it by gravity to the main tank. The flow of acid through the main tank is counter-current and the pump capacity is sufficient to completely change the liquor every few minutes. This active circulation is an important feature contributing to increased production and uniformity of product.



Fleet Line Carbonizing Ranges showing acid tank; dryer and baker not visible.

"Fleet Line" Cloth Tenter Dryer—(RIGGS)—One of the outstanding fea-

tures of this machine is the relatively small floor space that it occupies for a given production, due to the fact that the cloth is passed through in vertical layers instead of the customary horizontal layers. Other advantages of the vertical design are said to be: elimination of the tendency to sag in the middle, makes possible a more efficient heating and circulating system and permits greater flexibility as to capacity. Increased efficiency of the heating and circulating system is due to the fact that the heating coils and fans can be located at the bottom of the machine, the coils directly under the cloth and fans on both sides. The cloth passes through the machine in vertical loops on a pin chain, which uses heat treated Monel pins. The loops form sealed pockets in alternate passes, into which the heated air is forced under slight pressure, passing through the cloth, removing the maximum amount of

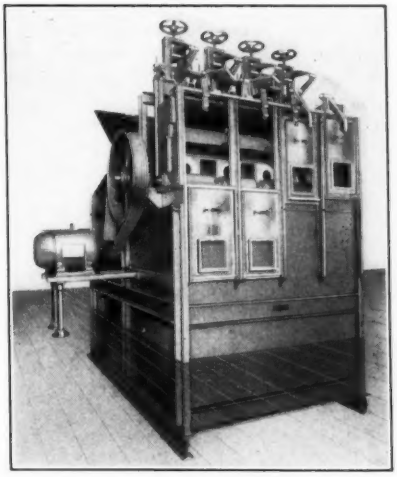


Fleet Line Cloth Tenter Dryer

moisture and securing a 40° to 60°F. temperature drop. The partially cooled air returns to the heater through the open pockets, passing down just inside the insulated sides, with a portion going to the exhaust. Flexibility as to capacity with this machine is due to the fact that capacity can be readily increased simply by adding another section to its length.

"Fleet Line" Semi-Continuous Dry Fulling Mill—(RIGGS)—this machine is said to be of exceptionally rugged all metal construction, to effect almost continuous production, to be exceptionally flexible, and to eliminate all carbon dust from the room.

It is made with 2, 3 or 4 compartments. Only the bottom rollers which continue clear across the machine are driven. The top rollers have individual bearings with individual pressures and toggle operating devices. The machine is normally motor driven and runs at relatively high speeds, effecting quick, uniform and thorough crushing on even the most burry fabrics which are composed largely of noils. Each compartment can be loaded or unloaded without stopping the other compartments, which feature is largely responsible for the high production and practically continuous delivery. The normal period of crushing is between 10 and 15 minutes. The fact that each compartment can be operated individually makes the machine



Fleet Line Semi-Continuous Dry Fulling Mill

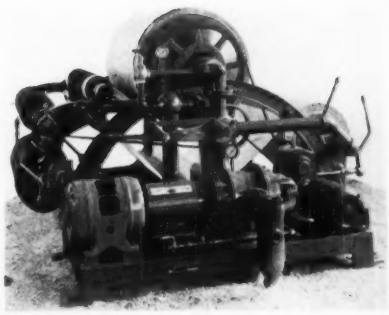
very flexible. If desired, 4 different kinds of fabrics, each requiring different crushing time, can be run simultaneously with excellent results on each. Exhaust connections on each compartment keep the room entirely free from carbon dust.

Flexible Coupling Valve — (NORDSTROM) — Nordstrom valves are now manufactured with hub ends which make it possible to connect to steel or cast iron pipe, through use of any standard, flexible coupling. Wherever pipe vibration, contraction or expansion is a problem, Nordstrom Flexible Coupling Valves are said to be the answer. Many of the sizes and types of hub-end valves may be inserted or removed from the connecting piping without disturbing the line set-up. It is stated

Flexible Coupling Valve

that construction programs are speeded up and joints stay tight when these valves are installed. These special valves embody all of the well known features of lubricated plug design and construction.

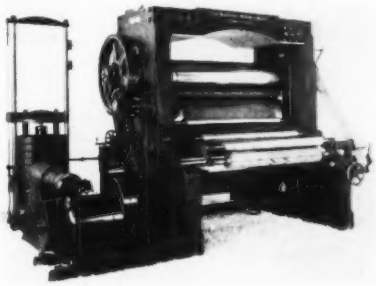
High Speed Decating Machine — (VAN)—it is stated that modern improvements have so perfected this unit that increased loading and unloading speeds are obtainable with perfectly controlled braking. It is further stated that quicker



High Speed Decating Machine

steaming and vacuuming time is possible on this unit and an automatic blanket straightening device has been incorporated to maintain finer control of the blanket at high speed operations.

Hydraulic Calendar—(VAN)—the following latest improvements have been incorporated in this machine: rolls operating in anti-friction, spherical roller bearings lubricated by a continuously circulating flow of filtered and cooled oil; accumulator arranged with lever set for various pressures; hydraulic three plunger pump, self contained, and automatically lubricated; roll

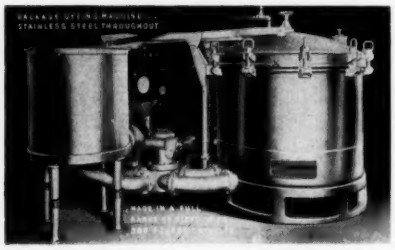


Hydraulic Calendar

pressures applied and released by an instant action control valve; unit arranged with necessary hydraulic piping and valves, with vibrationless tension controlled let-off, and with balancing expander arrangement on the friction take-up.

Package Dyeing Machine — (BUTTERWORTH)—this machine is said to incorporate new principles of design and many new and exclusive features that are real aids in dyeing all varieties of yarn in the various processes, including the developed and Indanthrenes. These results are said to be accomplished with a minimum of attention and economically as regards all elements of cost. Automatic time control and reversal of the direction of flow of the solutions are obtained by simple and quickly made adjustments of the timing instruments in the control panel. These

machines are equipped with new, more substantial, non-clogging spiral fluted type spindles.



Package Dyeing Machine

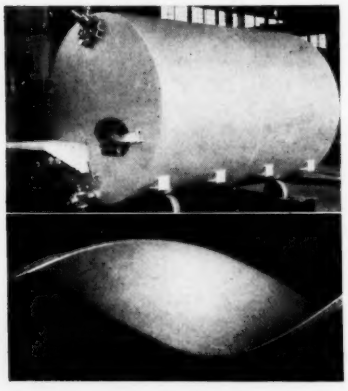
Silver-Ply — (JESSOP) — Stainless clad steel sheets and plates, which combine the corrosion resistance of stainless steel with many of the desirable properties of mild steel. They are suitable for cooking vessels, storage tanks and other equipment used in the processing and handling of va-r nish, chemicals, soaps, oils and gas, textiles, paper, pharmaceuticals, food, and in marine equipment, water works, and sewage disposal plants, etc., wherever corrosion or erosion are encountered. A typical vessel fabricated from Silver-Ply is shown in the upper part of the illustration.

It is claimed that Silver-Ply may be bent, spun into deep heads, deep drawn, drilled and otherwise worked with greater ease than solid stainless. Furthermore, it has better heat conductivity than solid stainless nad is nots ubject to "hot spots" —an important advantage when used in the fabrication of cooking vessels.

Silver-Ply is manufactured by a patented process which assures a strong, uniform, oxide-free weld between the stainless cladding and the mild steel backing. The strength of the bond is illustrated in the lower part of the cut, which shows a strip of Silver-Ply twisted into a spiral shape without any separation of the composite metals. Other features of the process are close control of the relative proportions of the component parts, and prevention of carbon particles from migrating to the stainless cladding, which might otherwise seriously reduce its corrosion resistance.

The usual sheet or plate of Silver-Ply consists of 20 per cent stainless steel and the balance mild steel, ordinarily of Flange quality; however, all degrees of cladding from 3 to 50 per cent have been successfully produced. Complete information and copy of specifications will be sent upon request.

Use of Silver-Ply

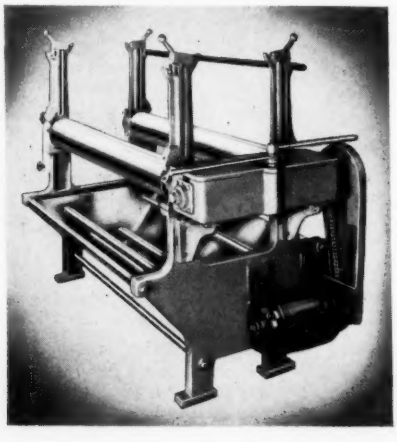


Stainless Steel Dye Box—(BLICKMAN)—It is stated that with this machine there will be no absorbing of colors nor rough surfaces to catch fabrics. The reels are also made of stainless steel which is said to result in longer life, greater strength and easier cleansing. The Blickman organization states that it has perfected a method of building idler reels out of light gauge stainless steel and added inside reinforcing to ensure rigidity. Reel supports are independent of the box and relieve the tub of all mechanical strain.

Blickman Dye Box

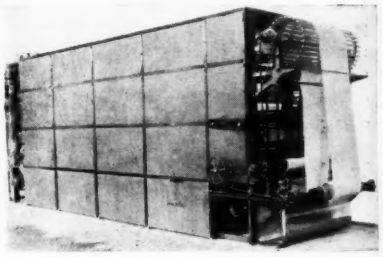
Stainless Steel Dye Jig — (BLICKMAN)—It is stated that this dye jig will give perfect satisfaction with the utmost ease of operation and a minimum of care with any material commonly dyed on a jig. It is said to be sturdily built to withstand any strain to which a jig might be subjected. There is said to be no danger of color contamination. It is further said that there is no fear of materials catching on roll brackets since the cups for immersion rolls are built into the tub and there will be no time wasted in boil outs as there are no sharp corners or intersections in the tub to catch dregs.

Blickman Dyeing Jig



Stainless Steel Scoops, Buckets, Paste Tubs, Starch Mixers, Linings for Jigs, Linings for Dye Boxes, Beakers, Pails, Ager Rolls, Idler Rolls, Batch-up Rolls —(BLICKMAN)—the foregoing products have recently been added to the Blickman line of stainless steel equipment for textile wet processors. Complete details are available from the manufacturer.

Tensionless Horizontal Conveyor Dryer—(VAN)—it is stated that redesign of the conveyor system, the heating elements and rebuilding of the direction airflow duct-work has resulted in increasing the production of this machine with increased efficiency and higher quality workmanship. This machine is designed for the handling of crepe qualities and, since at no time is any tension on the fabrics, full and natural shrinkage is possible and irregularities due to air-blast tensions and undue goods tensions are eliminated.



Tensionless Horizontal Conveyor Dryer

For further information on the development of textile wet processing equipment the reader is referred to the following articles which appear in this issue:

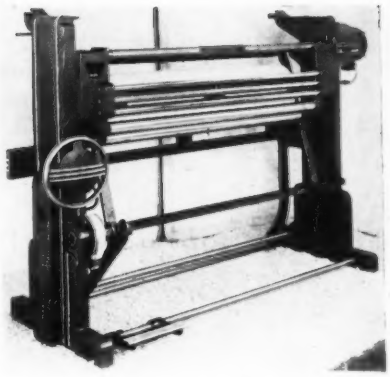
"Silk Hosiery Dyeing Methods —Past and Present"....page 489.

"Recent Developments in Textile Printing"....page 493.

"The Application of Dry Cleaning to Mill Processes"....page P520.

"Tomorrow's Textile Dryers" ....page P530.

Tensionless Tubing Machine—(VAN)—a unit arranged for accurate measurement. This high speed machine is arranged for the reversing of the tube-holder drive, the goods let-off is mounted in ball bearings and tension is not applied to the goods until after they pass the measuring drum. It is stated that since dynamic brakes equip the goods let-off, the goods measuring drum and the motor driving the tube-holder, the instant the operator releases the drive, the brakes are applied, eliminating inaccuracies due to slippage and over-running. This modern machine has been designed for high speed production work.



Tensionless Tubing Machine

Key to Manufacturers Names

AAP—American Aniline Products, Inc., 50 Union Square, New York, N. Y.

ACE—Ace Glass, Inc., Vineland, N. J.

A-H—Arnold, Hoffman & Co., Inc., Providence, R. I.

ARKANSAS—Arkansas Co., Inc., P. O. Box 210, Newark, N. J.

BICK—Bick & Co., Inc., Reading, Pa.

BLICKMAN—S. Blickman, Inc., Weehawken, N. J.

BUTTERWORTH—H. W. Butterworth & Sons Co., York and Cedar Streets, Philadelphia, Pa.

CARBIC—Carbic Color & Chemical Co., Inc., 451 Washington Street, New York, N. Y.

CARBIDE—Carbide & Carbon Chemicals Corp., 30 East 42nd Street, New York, N. Y.

CIBA—Ciba Company, Inc., Greenwich and Morton Sts., New York, N. Y.

COLGATE—Colgate-Palmolive-Peet Co., 105 Hudson St., Jersey City, N. J.

COMMERCIAL—Commercial Solvents Corp., 17 E. 42nd St., New York, N. Y.

COMMONWEALTH—Commonwealth Color & Chemical Co., Nevins, Butler and Baltic Streets, Brooklyn, N. Y.

CYANAMID—American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York, N. Y.

DUPONT—E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

GEIGY—Geigy Company, Inc., 89 Barclay St., New York, N. Y.

GLYCO—Glyco Products Co., Inc., 148 Lafayette St., New York, N. Y.

GENERAL—General Dyestuff Corp., 435 Hudson Street, New York, N. Y.

HART—Hart Products Corp., 1440 Broadway, New York, N. Y.

HERCULES—Hercules Powder Co., Wilmington, Del.

HYGROLIT—Hygrolit, Inc., Kearny, N. J.

INDUSTRIAL—Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.

JESSOP—Jessop Steel Co., 501 Green St., Washington, Pa.

KALI—Kali Mfg. Co., 1410 N. Front St., Philadelphia, Pa.

LAUREL—Laurel Soap Mfg. Co., Inc., 2604 East Tioga St., Philadelphia, Pa.

LUCIDOL—Lucidol Corp., 293 Larkin St., Buffalo, N. Y.

NATIONAL—National Aniline & Chemical Co., Inc., 40 Rector Street, New York, N. Y.

NORDSTROM—Merco Nordstrom Valve Co., Pittsburgh, Pa.

ONYX—Onyx Oil & Chemical Co., 15 Exchange Pl., Jersey City, N. J.

PHOENIX—Phoenix Color & Chemical Co., 24 Van Houten St., Paterson, N. J.

P&G—Procter & Gamble Distributing Co., Cincinnati, Ohio.

RIGGS—Riggs & Lombard, Inc., Foot of Suffolk St., Lowell, Mascachusetts.

ROHM—Rohm & Haas Co., Inc., 222 West Washington Square, Philadelphia, Pa.

SANDOZ—Sandoz Chemical Works, 61 Van Dam Street, New York, N. Y.

SYNTHETIC — Synthetic Chemicals, Inc., 57 Wilkinson Ave., Jersey City, N. J.

TEXTILE—Textile-Finishing Machinery Co., Harris and Sims Aves., Providence, R. I.

TITAN—Titan Chemical Products, Inc., Mill Road and Wayne St., Jersey City, N. J.

VAN—Van Vlaanderen Machine Co., 370 Straight St., Paterson, N. J.

WALLERSTEIN—Wallerstein Co., Inc., 180 Madison Ave., New York, N. Y.

WARWICK—Warwick Chemical Co., West Warwick, R. I.

WOLF—Jacques Wolf & Co., Passaic, N. J.

Permanent Softening Agents

DR. H. H. MOSHER*

THIS has been truly called the Age of Chemistry. The past century has witnessed the evolution of new industries, the rejuvenation and renovation of old and the introduction and application of new chemicals into almost every branch of our industrial life. Most of these changes have been made possible by the application of chemistry to commercial industry.

Among the brightest gems that chemistry has thus far achieved are two for which textile science may will be proud, namely, the developments of synthetic dyestuffs and rayon.

Originated only as an academic hobby, synthetic dyestuffs almost from their inception grew with such amazing rapidity that within a few years the older natural colors had been almost entirely supplanted. The development did not expand only because of price advantages but due to the superiority of the fastness of the dyes to light and washing and the greater diversity of the shades and ease of application.

Rayon was originally developed as an ingenious imitation of pure silk. It had only its luster to commend it and even this was too bright—too metallic. But by the diligent efforts of chemists and scientists the inherent defects of the early rayon filaments were corrected and rayon became first competitive with silk for popular esteem and later all but supplanted the product of the silkworm in the field of dress-goods manufacture.

A comparable development in textile auxiliaries and finishes has not thus far been achieved.

Prior to the incident of the World War but few major changes in the preparation and finishing of fabrics and fibers had occurred in several centuries. Soaps and alkalies were about the only detergents employed and soaps and oil emulsions, sometimes augmented with glycerine, were the usual softening agents. Finishes were invariably composed of starch, glue or natural waxes usually plasticized with soap or raw oil. Both the oil and size had but a transcient effect on the merchandise and it was customary for the customer to experience the phenomenon of submitting an attractive well bodied garment to laundering and to receive a laundered "rag" as its substitute or of observing a dry cleaner transform an apparel of alluring texture into a harsh, sandy piece of merchandise.

It was not until a decade or two ago that the manufacturers of textile auxiliaries and finishes, stimulated by the demands of the new rayon industry, changing fashions and an accelerating more critical popular demand for finishes of greater effectiveness and permanence, evolved textile auxiliaries and finishes from an empirical art into a more exact science.

The soaps and oil emulsions were largely replaced by the more potent sulfated oils and tallows as textile softening media, and these in part by sulfated and raw fat alcohols and other natural and synthetic oils and fat ethers and esters. These softening agents, however, possessed but little greater resistance to laundering and dry cleaning than the older soaps and oil emulsions.

The development of permanent softening agents may be considered as originating with the appearance of the so-called cationic oil complexes. Originally developed as dye-auxiliaries to increase the fastness of direct colors to washing, many years elapsed before the use of this class of compounds for finishing purposes became significant. Shortly after the World War a patent was issued to Hartman and Kagi on the use of the soluble salts of diethylamine-ethyl oleyl amide for increasing the fastness of direct colors on cellulosic fabrics. A few years later, a second patent issued to the same inventors disclosed that the stability of these salts to alkalies was poor, but that the quaternary ammonium compounds derived from the same base were much more stable and hence more adaptable to technical application.

These products, however, did not arouse any particular stir in the textile industry as dye setting agents. Simpler and less costly organic and inorganic salts were found to accomplish the same function quite as effectively.

It was not until it was discovered some four or five years ago that the quaternary ammonium derivatives of fatty bases and other cation active compounds possessed merit as permanent softening agents for cellulosic fabrics that interest centered in these preparations.

Since that time the various chemical organizations have vied with each other to discover and perfect organic derivatives which would accomplish a more potent and permanent effect on the cellulosic fabrics than the "quaternary ammonium" compounds, and the patent office has been deluged with patents designed to cover some newly perfected compound or its use.

Relatively few of the products covered in these patents are of immediate commercial value, however, due either to the expense of their manufacture, their lack of stability or lack of proper balance between the hydrophobic and hydrophilic portions of the molecule. Unfortunately most of the simpler quaternary ammonium compounds were among those that have but little utility for softening purposes. As a consequence the production of the newer softening agents is more complex than that required for most textile auxiliaries and finishes.

*Director Textile Research, Onyx Oil & Chemical Co.

Many of the cationic softening agents may be considered as derivatives of the quaternary ammonium bases and may be represented by the type formula

$$NR_4OH$$

in which R denoted either hydrogen atoms or an alkyl radicle.

Most proposed softening agents of the quaternary ammonium base type possess at least one of the alkyl radicles as a long straight chained alkyl radicle containing between twelve and twenty carbon atoms.

Textile auxiliaries and softening agents may be considered as simple hydrocarbons that have been solubilized by the introduction into the molecule of a solubilizing (hydrophilic) group or radicle. There are some exceptions. The hydrocarbon compound may be thus divided into a hydrophobic and hydrophilic portion. The nature of the hydrophobe and hydrophile and the balance between the two in a molecule determines the merit and usefulness of the product.

It is to the hydrophobe or hydrocarbon moiety of the molecule that most of its softening and lubricating properties are due, whereas the hydrophile acts essentially as the solubilizing radicle and a chemically active group. The hydrophobe is, however, modified in its physical properties by its coexisting hydrophile. By balance between the entities in a softener it is aimed to retain the inherent characteristic of each group intact. Too large or potent a hydrophile overbalances the hydrophobe and destroys most of the softening and lubricating characteristics whereas if the hydrophile is excessively small or weak the compound is too inert chemically and inclined toward water insolubility.

Aliphatic radicles containing between twelve and eighteen carbon atoms possess the proper hydrophobic characteristic whereas sulfate, sulfonate, hydroxyl, carboxyl, amides and amino residues may be selected as suitable hydrophilic groups.

Employing the hydrocarbon dodecane as an illustration we can by attaching sulfate, sulfonate carboxyl or amino residues to the hydrocarbon obtaining water soluble compounds in which much of the inherent lubricity of the hydrocarbon persists. Thus:—

$C_{11}H_{23}CH_3$	Dodecane
$C_{11}H_{23}OSO_3Na$	Lauryl Sulfate
$C_{11}H_{23}SO_3Na$	Lauryl Sulfonate
$C_{11}H_{23}COONa$	Lauric Acid salt of Sodium
$C_{11}H_{23}NH_3OOCCH_3$	Lauryl Ammonium Acetate

A perusal of the above table shows that each of the compounds listed possesses a $C_{11}H_{23}$ radicle and differs from the others only in its terminal ending. Altho dodecane is a water insoluble mineral oil and hence differs materially in solubility from the other four, a surprising similarity of chemical and physical properties can be noted in its sulfate, sulfonate and acid derivative. The lauryl ammonium acetate, which is a derivative of a quaternary ammonium base, however, is quite dissimilar in its reactions and properties. This difference is in a large measure due to the fact that the active portion of the molecule, insofar as textiles are concerned bears a different type of electrical charge.

IONIZATION

Almost all inorganic and many organic compounds although electrically neutral when dry, dissociate in aqueous solutions into electrically charged particles known as ions. Half of the ions bear positive electrical charges and are known as cations, whereas an equal number of negative charges exist in the solution. Particles bearing these negative charges are called anions. It is to these ions that the properties of a solution depend.

All of the older types of textile auxiliaries such as the soaps, sulfated oils and fat alcohol contain on the long hydrocarbon chain a negatively charged particle or anion, whereas the cation or positively charged particle is attached to the alkali which may be a sodium, potassium or triethanolamine ion. Soap is stable only in alkaline media. The addition of moderate amounts of common alkalies and salts such as sulfates and phosphates have but little influence upon its stability, but the addition of salts of calcium, magnesium and the heavier metals induce rapid separation.

The quaternary ammonium derivatives and cationic softening agents on the other hand consist of the cation contained on the long hydrocarbon chain, with the anion, which may be the chloride or acetate radicle, attached to the acid radicle. All finishes which bear the cation on the long hydrocarbon chain are known as Cationic finishes. Cationic finishes as a class are more stable in acidic solutions than in alkaline, possess excellent stability toward lime and heavy metallic salts, but tend to be precipitated by sulfates and phosphate.

This difference in stability to various reagents becomes of great importance in mixing cationic with other material for modifying the finish effect. Except in very rare instances equivalent amounts of cationic and anionic compounds cannot be mixed without precipitation.

A peculiar phenomenon is observed, however, when both bodies are efficient emulsifying agents. The insoluble substance which precipitates upon mixing equivalent weights of the cationic and anionic compounds is readily dispersed by a slight addition of either component. If the excess is the cationically charged body the solution acts towards the fabric cationically and shows but little trace of the other ingredient. Where the anionically charged finish is in excess the converse is true and the mixture is no more permanent than the anionic component of the finish.

In this connection soaps, sulfonate oils, gums, glues, starches and similar sizes may be considered anionic and should not be employed with the cationic softeners.

Many materials however are used in finishing and sizing baths which are neither cationic or anion. To this class belong the sugars, dextrines, urea and most resins. Such compounds are suitable adjuncts for addition to the

permanent finishes when additional weight or body is required in the finishing operation.

Although cationic finishing agents are commonly referred to simply as softening agents, it is unfortunate that such a term has been applied. A softening agent usually is regarded as an agent which will promote a certain ragginess to fabrics,—enhanced pliability or collapsibility. Cationic finishes, however, owes much of their popularity, not alone to the permanence of its action, but to its effect on the touch or surface effect.

It is not to be inferred however that merely because a finish is cationic it imparts both permanence and softness to textiles. Almost all permanent softening agents are cationic, but not all cationic finishes are permanent. Permanent softeners are apparently due to some peculiar balance and union between the cation of the finish and anion of the fabric. If either is not suitably adjusted a permanent union does not occur. Similarly, the softening effect can be traced to a balance between the length of the hydrocarbon chain and type of terminal amino residue to which it is attached.

PURPOSE OF CATIONIC SOFTENERS

Cationic softeners are applied to textiles to accomplish one or more of the following functions.

1. To obtain softening effects unobtainable with the older types of softening agents.
2. To secure softening effects permanent to both laundering and dry cleaning.
3. To increase the ease of finishing or to remove congestion in some particular part of a plant.
4. To reduce chemical cost of finishing and the expense of handling.

THE USE OF CATIONIC FINISHES TO OBTAIN SUPERIOR EFFECTS

Cationic finishes are substantive to cellulosic fabrics. Their ions are absorbed from solution in much the same way that dyestuffs are absorbed, and entering into the micellar configuration of the filaments, they impart a softness not securable by a simple surface coating. The molecules being large and waxy it appears probably that some at least orient themselves about the surface of the fibers and impart a peculiar waxy touch. This peculiarly waxy softness is unobtainable with the older type of softening agent and which are almost without effect on fabrics composed of spiral and nubby yarns. The cationic finishes have proved of particular interest in finishing velvets, spun rayon fabrics and all types of material composed of spiral and tightly twisted yarns.

PERMANENT SOFTNESS

Very few of the older types of softening agents imparted to textile fabrics any degree of softening permanence.

It has been previously mentioned in this paper that the mere fact that a finish is cationic does not necessarily guarantee permanence. Cationic finishes properly balanced and bearing suitable hydrophiles are remarkably fast to washing and will persist throughout the life of the garment. It must be understood, however, that this permanence applies only to the softness imparted by the softening agent and not that developed by calendering and other mechanical operations.

This permanence of softening effect obviously is of particular interest and use in conjunction with the permanent sizing agents. Most sizing agents require some type of plasticizer or softening agent. The joint use of a permanent size and softening agent, transcient to washing or dry cleaning will of necessity produce a harsher hand after laundering operations.

CATIONIC FINISHES SIMPLIFY FINISHING OPERATIONS

The older types of softening agents required a quite considerable concentration of chemical to secure the desired softening action. As a consequence the dyed material was invariably given a special application of finish in some type of finishing equipment, usually a quetsch. That of necessity required extra handling and additional steps in the operations of converting greige goods into the finished merchandise.

The cationic finishing agents being substantive are absorbed almost completely from solution by cellulosic fabrics. This action permits the addition of cationic softening agents to the last rinse subsequent to dyeing and eliminates costly man handling in the finishing room. In addition to the savings realized by this factor, the actual chemical costs involved is often less than where the older types of finish are employed. Athough the cationic softening agents are several times more costly than the older types of finishing agent, their substantive characteristics and the fact that much less material is required to produce the same softening action, make it possible for finishers to actually reduce the cost of their softening agents through the use of this class of finishes.

THE FUTURE OF CATIONIC FINISHES

It appears likely that the next few years will see improvements in the development of new products of this class and new and extended uses of existing cationic finishes. The employment of cationic compounds as emulsifying agent can be confidently expected, due to the fact that the dispersed particles will bear positive rather than negative charges.

The employment of these finishes to wool to increase its affinity for rubber latex and similar finishing materials may likewise become of importance, and the use of these softeners in conjunction with permanent sizes is already assuming increased importance.

Cationic finishes, even though not yet fully perfected, appears a valuable link in the evolution of textile auxiliaries and finishing agents.

NOTE: The writer wishes to acknowledge indebtedness to Mr. Robert Ackley, Industrial Fellow for Onyx Oil & Chemical Co. at Mellon Institute for some of the material contained in this paper.

Metallized Acid Azo Dyes

M. L. CROSSLEY*

THE patent literature[1] discloses a large number of azo dyes which metallize to form products capable of dyeing wool from an acid bath in a variety of colors of excellent fastness to light. Not all of the metallized azo dyes described are of commercial importance. In fact only a small percentage of the large number made have practical value. However, in most cases the metallization improves the light fastness of the dyes. It may not always improve it sufficiently to make the products useful. The degree of fastness depends primarily on the molecular structure of the dye and the metal used for the metallization. A large number of molecular configurations among the azo dyes have been shown to be suitable, provided that they contained proper metallizable groups. The dyes suitable for the production of stable metallic compounds are o-hydroxyazo compounds. The best results are obtained as a rule by metallizing with chromium and copper compounds. However, in certain cases, cobalt and nickel azo dyes give results not greatly different from those obtained with the copper compounds of the same dyes. Iron and manganese give bathochromic effects, largely tones of brown of good fastness to light but not always of as high a degree of fastness as obtained by introducing chromium or copper in the same molecular structures. In certain cases the iron appears to be less firmly bound in the dye molecule than the other metals.

The exact constitution of the metallized dyes has not yet been proven. It would appear that the metal is in a unique relationship with the organic system and probably this involves the azo group ortho to the functional metallizable groups. Several suggestions have been offered for constitutional structures which might be in keeping with the requirements based on the properties of the products but no one of them is entirely satisfactory. It is safe to say that the molecular structure is not as simple as we would write it. The conventional method of representing valence forces as solid lines which imply forces of constant value is convenient but does not necessarily give a true picture of the actual state of the energy distribution in the molecule at any given time. The reactivity of such products suggests that what we represent as unit forces may be complex, changing in value constantly and passing from one extreme phase to another. The degree of change and the frequency of the shifts in energy will be determined in part by the nature of the atoms and their arrangement in the molecule. We write o-hydroxyazo dyes but we are not certain that there is an hydroxyl group always functioning in a normal manner. Is the group associated with one of the nitrogen atoms and is this brought about by the inter-relation of the hydrogen of the hydroxyl with oxygen on the one hand and nitrogen on the other? Is the nitrogen involved that nearest to the carbocyclic nucleus contributed by the diazo compound? Is there an actual shift of hydrogen to nitrogen? The available evidence will not permit of definite answers to these questions. Much more evidence must be obtained before the constitution of such products can be stated with certainty.

The structure of a dye is important not only because of its influence on the color but also for its effect on other properties such as solubility and level dyeing characteristics. As a rule, metallization does not enhance level dyeing properties of acid dyes. In general the metallized products dye less evenly, provided no assistants are used in the dye bath. Of course the majority of acid dyes color wool unevenly. The degree of uniformity of the color distribution in the wool depends upon several factors. In the first place the lack of uniformity of the wool plays an important part. The degree of hydration of the fiber is undoubtedly important and of course the type of sulfur proteins in the wool fiber has been shown to have a decided influence on the uniformity of color distribution in the fiber. The orientation of the dye in the fiber is also dependent upon the structural arrangement of the atoms and groups in the dye molecule. Molecular association of dye and components of the fiber must play an important role in the dyeing process. We should expect that the introduction of metal in a dye, whatever its true relation with the other molecular components, would influence the reactivity and particularly the dyeing properties of the dye. Of course the dye may not distribute itself uniformly in the fiber and yet to the eye the color produced would appear level and would be entirely satisfactory in practical use. There is a big difference between level dyeing results as measured by the eye and the results shown by microscopic examination. From a scientific point of view it is necessary to use complete uniformity as the standard but from the practical point of view we are interested mainly in what the color appears to be when we look at it under normal conditions.

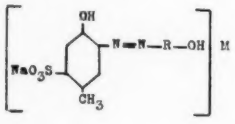
From the many metallized dyes synthesized certain chromium, copper and iron compounds have been chosen for commercial development. They are sold under trade names such as Calcofast, Neolans, Palatines or Pilatus colors. The bulk of the work to develop these, judging by the number of patents granted, has been done in Germany, Switzerland and the United States. Progress

*Research Director, Calco Chemical Co.

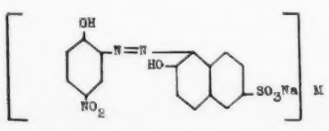
has been slow. The problems are complex and the development, like all similar developments, is an evolution in which one thing grows out of another and the final result is the composite of what has been learned up to the time the choice is made.

We have elected to study certain structures among the mono and polyazo dyes to see what effects could be produced by introducing such metals as chromium, copper, iron, aluminum, manganese, cobalt, nickel, vanadium, titanium, zirconium and various combinations of these. In general the most promising results are obtained by metallizing with compounds which will furnish chromium, copper, nickel, cobalt, iron, manganese and titanium. The combinations of metals of particular interest are: Chromium-copper, manganese-copper, iron-copper, chromium-iron and nickel-cobalt.

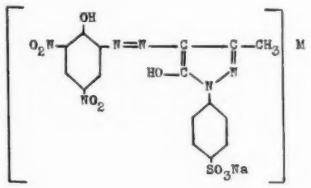
Fast-to-light tones of blue, red and brown colors are obtained on wool with the metallized dyes formed by coupling alkyl derivatives of o-hydroxydiazobenzene, containing a sulfonic acid group in position five, with naphthols and substituted naphthols such as the naphthol sulfonates and carboxylates. These products are illustrated by the following general formula in which R is an aryl nucleus and the OH group attached thereto is ortho to the azo group. M represents one or more of the metals mentioned above. It is not intended to suggest by the formula that the dye and metal is in a 1:1 ratio. This varies with the metal and type of dye used.



Various substituents may be introduced on the rings without changing the essential characteristics of the metallized dyes. The solubility of the dyes is influenced by introducing solubilizing groups such as sulfonic and carboxylic and slight differences in hue may also be had by the introduction of different substituents, such as NO_2, CH_3, Cl, etc. When beta naphthol is the coupling component in the above a product is obtained, by metallizing with chromium, which dyes wool a blue color of excellent fastness. Using B-hydroxynaphthoic acid instead of B-naphthol and metallizing with copper gives a product which dyes wool a bluish tone of red of excellent fastness. The metallized compounds obtained by treating the o-hydroxynitrophenylazo-B-naphthol sulfonic acids with compounds capable of furnishing chromium, copper, or iron to the dye so as to give stable metallic complexes are of interest. They dye wool and leather fast to light tones of brown. They are illustrated by the formula:

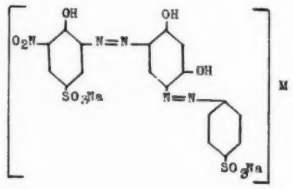


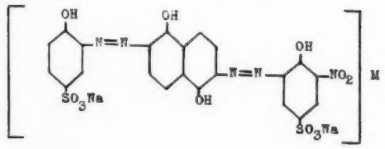
The o-hydroxyazo dyes obtained by coupling o-hydroxynitrophenyldiazonium chloride with phenylmethylpyrazolones and their sulfonic acids give interesting products when metallized. They produce on wool and leather yellow to olive brown colors of excellent fastness. They are represented by the general formula:

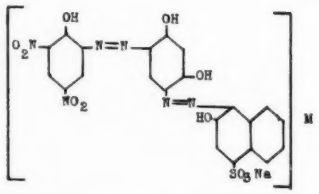


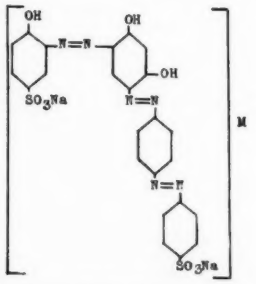
In the polyazo dye series important products are obtained by metallizing the dyes formed by coupling a dihydroxyaryl compound, capable of combining with two molecules of a diazo compound in positions ortho to the two hydroxyl groups, with diazoaryl end components, one or both of which contains a hydroxyl or other metallizable group ortho to the azo group, and at least one of which contains a sulfonic group. For the most part these products give rich tones of brown on wool and other animal fibers and the colors are of good to excellent fastness to light.

They are represented by the general formulae:









(Concluded on page 492)

Silk Hosiery Dyeing Methods

Past and Present

LOUIS S. ZISMAN*

WE are living in a constantly changing age, an age in which research has virtually come to our back door. Trade journals, magazines, and newspapers are acquainting the public with new discoveries in almost every industry. Numerous patents have been taken out for the manufacture of new synthetic fibers. Nylon is perhaps the most outstanding example. Because of its unusual strength, elasticity and silk-like characteristics, it has great possibilities as a suitable fiber for hosiery.

We know very well of the remarkable progress made in the field of plastics. In addition to their uses for moulding objects, many synthetic resins, when properly applied to fibers, often change the very character of the fiber, and more or less permanently add desirable features, such as body, feel, strength, crush resistance, etc.

The application of the synthetic resins to fibers is not new, but its development in silk hosiery finishing is only beginning. Although many other types of finishing agents, including delustrants, splash proof compounds, as well as stiffening and softening materials, have more or less complicated finishing procedure in recent years, further complexities will tax the resources of chemists and dyers even more. Constant changes and adaptation rule the technical world of today, perhaps more so now than ever. The application of various finishing mixtures has necessarily brought about modifications in the dyeing procedure itself. Before mentioning some of these changes, it might be well to review past dye methods, and it might not be amiss to stress old principles which are still fundamental.

DYEING METHODS OF THE PAST

About twenty-five or thirty years ago when silk hosiery was more or less in its infancy, most of the dyeing was carried out in wooden vats, polling the goods in order to get good penetration and even dyeing. A good neutral olive soap was generally used and it was customary to discharge the silk gum first. The stockings were then rinsed to remove the gum soap, after which they were taken out from the vat, hydro-extracted and disentangled before entering them into the dye vat. In other words, a two-bath process was the practice.

There were comparatively few colors, namely black, white, cordovan, navy, and perhaps one or two tans or grays. The styles were limited to a few types, mostly what is known today as service weights. A ten or twelve thread number and a few sheers completed the range.

Chemical finishes, as we know them today, did not exist. The only necessary finishing requirement was to give the stockings a slight scroop in the last rinse. Even with such simple procedure, there still were many dyeing difficulties to overcome. Let us analyze them.

Prior to this time, dyers were familiar with the dyeing of cotton and wool hosiery. Also many dyers were experienced in handling mixed fibers consisting of cotton, wool, silk and to some extent rayon. The dyeing of silk hosiery, however, presented new problems. Unfortunately most of the dyers experienced in the handling of cotton or wool hosiery knew little if anything about silk. On the other hand the majority of silk dyers knew nothing about the working of a stocking. However, the dyers who could learn quickly, adapt themselves readily, and rely more upon fundamental principles, particularly in relation to penetration and levelness, got along faster.

FUNDAMENTALS OF HOSIERY DYEING

The fundamentals of dyeing are as dependable today as they were then. They are simple to understand, but it is strange that in the midst of concentrating on newer ideas and in the rush of completing production, we are apt to forget about the simple rules that are usually necessary to follow. The more important fundamentals in the dyeing of hosiery may be listed as follows:

1—*Circulation of the Dye Liquor and Goods*

This means proper relation between the weight and bulk of goods to the liquor volume, thus preventing overcrowding. Suitable means of agitation is essential for the goods and dye liquor so as to produce uniform penetration of the dye into the fiber.

2—*Levelness*

A suitable selection of dyes is required. Feeding colors slowly and uniformly is essential. The dyes should be well dispersed. Temperature and time must be controlled. Slow starting means a quicker and more satisfactory finishing. Retardation of the dye is an old and reliable principle used to promote levelness. If a penetrating agent is used, it should have a retarding influence as well as other properties.

3—*Control of the Dye Formula*

The dyer must be boss, not the lot. That means a systematic control of dye formula. Dyes must be positive in effect. If the dyer desires that the cotton should be filled up and not the silk, he must know what dyes will do the trick. The pH factor, which has finally made its entrance to the dye house from the laboratory, is merely a quicker means of measuring the intensity of the alkali or acid condition. The pH of the bath must also be under control. In the past, few dyers understood the item known as pH, but many of them had at least some working knowledge of this important factor.

4—*Matching*

An accepted sample or standard must be in the dyer's

*Head Dyer and Chief Chemist, Gotham Silk Hosiery Co.

hands. Standards should be protected from undue exposure and fresh standards should be supplied frequently. If the color matches well under a Mazda lamp as well as in daylight, complaints will be minimized.

5—*Sampling*

It is necessary to devise a quick means of washing, finishing and drying a sample taken from a lot so that it will duplicate actual machine conditions as nearly as possible.

6—*Knowledge of Available Materials*

This, of course, has to do with an intelligent understanding of the water, dyes, chemicals and other auxiliary agents used.

MACHINERY DEVELOPMENT

Long before the modern silk hosiery dyeing machines were perfected, large iron rotary type machines were made to dye sulfur black on cotton hosiery (Fig. 1). Wooden machines, known in the olden days as the chromer for developing aniline black with the bichromate solution, were also constructed. This type was also used for cotton hosiery (Fig. 2).

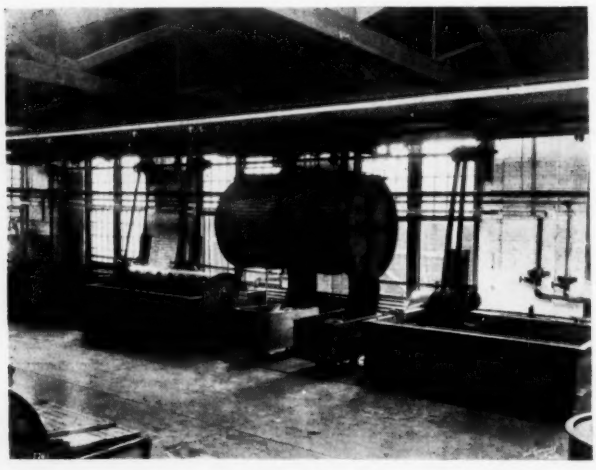
With silk replacing cotton, the above machines were not at all suitable. Aside from the danger of chafing, the sulfur black or aniline black methods of dyeing were not suited for silk. Iron was out. The first type of equipment employed was a simple smooth wooden vat polling the goods by hand in order to create circulation.

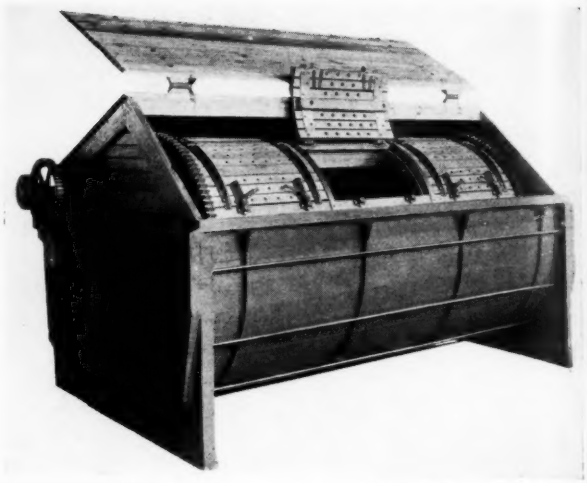
As silk hosiery became more generally used, the paddle and rotary types of machines made of Monel metal were simultaneously developed. In order to keep the cost of these machines as low as possible wooden tanks lined with metal were often used. Fig. 3 shows one of the first models of Monel metal machines.

With greater and greater acceptance of silk hosiery the design of the dyeing machines was changed to meet present day conditions. Practically all modern machines are of Monel metal or stainless steel.

Figure 1

Photo, Courtesy, James J. Diamond





Photo, Courtesy, Bond Bros.

Figure 2

Fig. 4 shows a modern rotary. Fig. 5 shows a modern paddle.

Today 50 to 100 lb. machines are the average sizes used, excepting in mills which have exceptionally large productions.

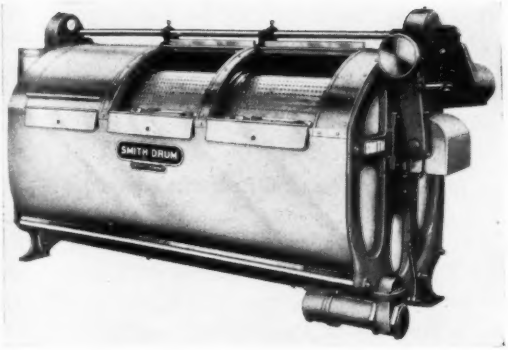
METHODS OF DYEING HOSIERY

We have often heard discussion about the so-called one bath, two bath, and split bath methods of dyeing hosiery. There are varying opinions as to their relative merits. It might be well then to find out what the differences are and why a particular method is selected. We know that satisfactory results can be produced by any one or all of the methods mentioned.

As discussed earlier, the two bath method, that is, boiling off first and subsequently dyeing in a new bath, was the logical choice of dyeing in the beginning. It was quite natural that dyers should think of eliminating the silk gum, throwing oils and tints present, before starting to

Figure 3

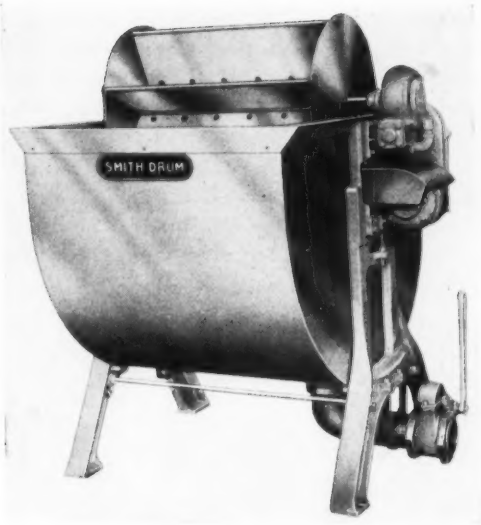
Photo, Courtesy, Smith Drum & Co.



LEFT—Figure 4

Photos, Courtesy, Smith Drum & Co.

RIGHT—Figure 5



dye. In handling silk yarn or piece goods, that was always the best practice, but hosiery dyers soon found out that they were using excessive soap in the dyeing, so as to promote greater penetration and evenness. They also discovered that it required practically as much soap in the dyeing as in the original boil-off bath. What really happened was that a large amount of gum soap or boil-off liquor formed. Now it is a well known fact that boil-off liquor increases levelness and penetration in silk dyeing. For this reason, silk dyers often save this boil-off liquor for their dyeing. As a result of these observations an attempt was made to dye and boil-off the stocking in one operation. This idea met with success in spite of certain difficulties such as dye exhaustion, matching control, timing, etc. These problems, however, were soon solved. Of course, some men still believed that the older method was sounder. It is not the purpose of this article to discuss the pros and cons of either method, since that has been well done by previous writers.

We might, however, clear up the third method, namely, the split bath process. What is meant by the split bath? Does it mean that the original bath is partially thrown out? If so, to what extent? How much initial degumming takes place? How is the dyebath then adjusted to complete degumming? Does it mean that we actually have a two bath process? What are the particular advantages? It is difficult to give an exact answer to the split bath method of dyeing because the opinions pertaining to it vary so much. It would seem to us that in the split bath method, according to its name, there is a partial degumming in the first bath to which some degumming agent is added. Half of this bath is later thrown out and to the remainder water and more degumming agent is added whereupon dyeing is begun.

It appears that there is some lack of control in this procedure, for how are we to measure the actual amount of degumming that has taken place in the first bath? How are we to judge exactly how much additional degumming agent should be added to the dye bath? Furthermore, how can we accurately measure the volume of the initial liquor thrown out and isn't there a good deal of guess work in regard to this matter? Still there are some who believe there are advantages in the so-called split bath method, but in order to have better control in the dye bath, we believe that it would be wiser to modify the first bath as desired and when it has accomplished its purpose, throw it out completely. We can then prepare a well regulated dye bath.

The split bath idea probably came into being because of difficulties arising in the one bath process. These were undoubtedly due to certain throwing oils, originating from the soaking of the silk. Frequently these oils would not be completely emulsified in the single bath. (Dyeing and boiling-off together.)

Perhaps another reason for using the split bath method was on the grounds of economy. It is obvious, however, that lack of control does not always spell economy. How then are we to take care of the impurities coming from the soaking process, and remove them from the silk without entirely discharging the sericin itself? This can be accomplished by preparing a preliminary bath containing a minimum amount of emulsifying agent, and running it for a limited period so as to remove dirt, tints, throwing oils, etc., present in the thrown silk, before dyeing. This idea has worked out very successfully in certain plants, for the method is flexible enough to modify the dye baths or even the preliminary baths to suit special conditions and requirements.

SPECIAL DEGUMMING AGENTS

The production of degumming agents and finishing materials is, of course, the business of a specialized chemical house. Often they are successful in developing agents which fit new processing requirements. Sometimes, however, they may be too radical in advising uses for some of their materials. For example, it wasn't so many years ago, and to a certain extent, it is true today, that many so-called boil-off oils were offered to replace soap. At first, some of these products contained altogether too much alkali for the best protection of the silk. Later the alkali combinations were more carefully adjusted so that their action on silk would be less harmful. Of course, it must be

admitted that some of the boil-off oils rinsed faster and left less residue on the stockings, thereby minimizing spotty troubles upon the application of splashproof compounds. Yet in many other cases, new spotty conditions arose as the result of incomplete emulsification.

More recently, various degumming powders have been prepared. Dyers with little or no knowledge of the constituents of these products often ran into trouble, such as harshness of goods, undue chafing and spotty results.

Some of the degumming powders have served a definite purpose. To specially selected alkalies, valuable protective ingredients were added, i.e., wetting out, penetrating, emulsifying agents, also lime inhibitors. If the boil-off powder did not contain sufficient fatty matter, i.e., soap, it was necessary to add either a neutral, low titer soap or a sulfonated oil in order to promote suitable lubrication and softness of the silk.

While many advantages can be advanced in favor of degumming powders, they should only be employed with caution and before deciding on what percentage to use, the total alkalinity factor must be determined. The main advantage of certain degumming powders lies in the fact that they render the goods less susceptible to spots upon the application of finishing materials which are particularly sensitive to fatty acids and sulfates.

It should be remembered, however, that a good neutral low titer soap is still the most natural degumming agent for silk.

The subject of degumming as it is practiced today lends itself to much debate. Quoting from the bulletins on Silk Degumming of the Textile Research Division of Procter & Gamble:

"Boiling-off is the most important process in finishing silk because it influences to a large extent the physical properties of the silk fiber as represented by the luster, hand and wearing qualities of the finished fabric."

For a comprehensive investigation on this subject we can highly recommend an article written by Walters, Hougen, and Wolf, "Silk Degumming," *Textile Research*, Vol. V, No. 2, pp. 92-104 (1934); No. 3, pp. 134-48; No. 4, pp. 191-211 (1935).

TEXTILE CHEMICAL SPECIALTIES

We know very well that today, as in the more recent past, there have been many new requirements in the finishing of silk hosiery. Ten years ago or so, the demand for dull appearing, close mesh stockings became widespread and the chemical houses were busy preparing various delustrants and the dyers even busier in trying to make them work. Time and research was necessary to perfect these agents as well as to master the technique necessary for their application.

Soon enough, newer demands required that the stockings, especially chiffon, should have more body, and better feel. In many instances, splashproofing was desirable. In addition to supplying new needs to the dyer, the chemical houses rapidly came along with a long series of various auxiliary chemicals which were supposed to help the dyer out of any trouble that might come up. The employment of many of the new agents necessarily brought about some modifications in the dyeing itself.

Adding finishing agents, delustrants, gums, waxes, splashproof compounds, resins, etc., often complicated matters giving rise to fatty acid or waxy-like spots as a result of unstable emulsions or reactions between residual soap or lime soap and the finishing materials. The chemist or dyer working out these problems quite naturally had to alter methods of dyeing and had to consult more often with chemical houses, many of whom were quite successful in formulating new degumming, emulsifying and wetting out agents, as well as lime inhibitors.

However, there seems to be no end to the confusion arising from the ever increasing list of chemical assistants and finishing agents that are constantly coming out. The American Association of Textile Chemists and Colorists through the cooperation with many chemical houses have enumerated a number of chemical specialties, giving at least some idea of their chemical constitution and behavior. This is indeed helpful. That many of the specialties now have a definite place in the dyeing process is not to be questioned although there are quite a number of materials whose usefulness is often uncertain, and the fact that many different names are assigned to a product with the same chemical formula is often perplexing.

It is our business to solve present-day problems. As pointed out before our past knowledge of fundamentals and a more complete understanding of the composition, uses and application of newer chemicals are our best guides. Quite naturally many problems will face hosiery dyers of tomorrow. Nylon, Vinyon and other synthetic fibers will undoubtedly soon find their places in the hosiery industry. With their coming, suitable methods of dyeing and finishing will have to be perfected.

Metallized Azo Dyes—

(Concluded from page 488)

The above products represent a few of the products which we have produced in the course of our investigations during the last several years[2]. They suffice to indicate the scientific and technical problems involved in the development of metallized dyes. This account is in no wise intended to cover all the work done in the field. The nature of this paper makes impossible a proper treatment of the splendid work done abroad in this field of research and technical development. For this work one should consult the patent literature[3].

References

[1]American patents on o-hydroxyazo dyes that are metallized.
[2]Crossley & Shafer: U. S. P. 2,034,390; 2,086,854; 2,120,799 and 2,136,650.
[3]Same as 1.

Recent Developments in

Textile Printing

P. J. WOOD, F.A.I.C.*

DURING the last two years, economic conditions have focussed attention on increased production with consequent lowering of costs.

Activities in this direction have not been confined to the printing machine alone, but have extended to every machine and operation throughout the textile printing plant.

Many of the new machines and methods introduced during this time are still too new to say positively whether they will stand the test of time or not.

PREPARATION OF GOODS BEFORE PRINTING

Probably one of the most revolutionary changes which has been suggested, and which is said to have been in continuous use for some months in one of the Eastern dyeing establishments, is a continuous peroxide bleaching machine, developed by the chemists of an important manufacturer of peroxide and the engineers of one of the oldest manufacturers of textile machinery.

This device consists of a suitable arrangement for impregnating the goods with the necessary liquid, after which they are passed into a "J" box, constructed of stainless steel, which is enclosed in a stainless steel steam box. On emerging from the steam box the goods are washed either in the open width or in rope form and dried for printing. This method supersedes the conventional method of kier boiling and washing, souring and washing, chemicing and washing, white sour and washing. It will be readily seen that the saving in time and labor must be enormous and the saving in floor space, as compared with the machines employed in the regular process, is considerable.

This system appears to be applicable to all-cotton goods and rayons and mixtures of these two fibers.

In the preparation of rayon goods, it is still customary to treat some particular qualities by the old hand method of suspending in tubs, which is a method both slow and tiresome, and which depends too much for its successful operation on the skill of the workman.

However for some time now, most rayon print cloths have been prepared on one or other of the various forms of continuous boiling-off machines. Many of these have been considerably improved during the last couple of years, particularly as regards speed of operation. Probably the greatest advance has been made in the so-called "conveyor" type of creper and boil-off machine. Originally all these machines were made to run at constant speed, but today they are provided with variable speed which makes them much more flexible and applicable to a greater range of fabrics.

DYEING OF GOODS BEFORE PRINTING

The introduction of stainless metal as the material for construction of dyeing machines, beck, padder and jigger, came as a boon to the dyer. Not only because it removed the menace of bleeding-in from the wood of some of the dyestuff absorbed in previous operations, and consequently increased difficulty in exacting matching shades, but it rendered unnecessary the frequent stripping or bleaching of the tubs. This involved expenditure of time on a non-productive operation, use of expensive materials and undue wear and tear on the tubs.

Within the last half dozen years, the gradual change from wood to metal has been taking place and there was much to learn as to the changes in construction detail necessary to take care of differences in behavior of the new materials. For instance, it was found that a radical change in the type of reel was required, on account of the difference in traction of wood and metal. During the last two or three years different types of reels have been put on the market which seem to do nearly everything that the wooden reels did, and which can be used for practically all classes of fabrics. The dye beck was originally used as a multiple strand machine. That is to say, each piece was loaded separately into its particular space along the machine and sewed into a continuous strand by itself.

A recent invention makes it possible to load the entire machine in one continuous strand, necessitating the sewing of only one seam. Of course, this method has been employed in some print-works for quite some time, with more or less success, using a system of pot-eyes to direct the goods from one end of the machine to the other, on completion of the circuit. Numerous difficulties were encountered inasmuch as the strands would gradually tighten while passing through the machine, on account of greater friction at some point, with the result that all the goods would accumulate at one end of the machine. This device has a variable speed arrangement at the feeding end of the machine which delivers the goods at a regular rate and prevents piling up.

The chief advantage of this apparatus is that it can be attached to an existing machine and it avoids the breaking of seams. The goods can be brought from the boil-off

*New England Manager, Royce Chemical Company.

machine to the dye-tub in a continuous web, unloaded from the tub in the same form, extracted and dried ready for printing. Another advantage is that all pieces pass through all parts of the dye-tub. In this way the variations in shade due to the variation in temperature in different parts of the dye-tub are eliminated. According to the claim of the inventor, it is possible to load 33 per cent more goods into the tub.

The improvement of the tensionless jigger in recent years has made possible the dyeing of many qualities on this form of machine that were dyed on the dye beck in former times.

Where labor conditions are favorable, the adoption of the automatic jigger can be shown to make a decided saving. Here again the adoption of stainless metal has proved of inestimable value.

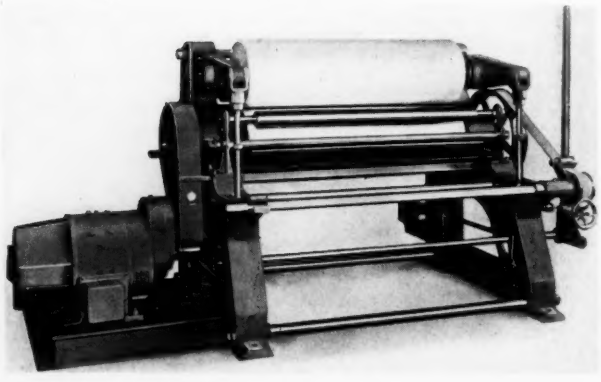
Padding machines have been greatly improved (Figures 1 and 2). Rubber manufacturers, working in close cooperation with machinery makers, have produced superior rubber covered rolls which allow of greater pressures than formerly possible. This, together with troughs of special design accommodating minimum volume of padding liquor, permits the attainment of higher padding speeds without the attendant risks.

A recent introduction is a two-speed padder running 80 yds. and 160 yds. a minute, to take care of qualities of varying weight.

Figure 1

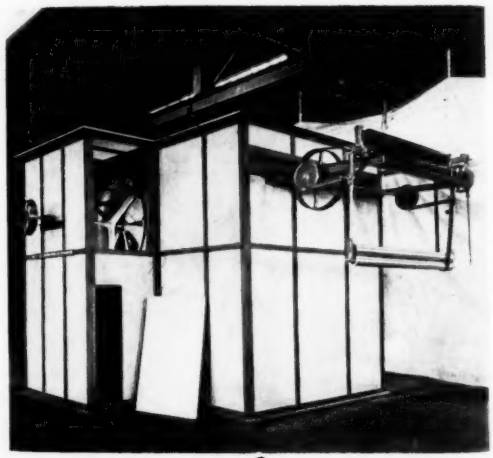
Photos, Courtesy, General Machine Co.

Figure 2



THE PRINTING MACHINE

Printing machine speeds, particularly when it comes to printing rayon goods, have been greatly increased as compared with former practice. This has necessitated a revision of the system of drying in some instances, and in this respect, the drying apparatus connected with the printing machine has undergone more changes than any other part of this equipment. In air-drying, the change has taken the form of additional supply of heated air, and there are several forms of new dryers on the market in various stages of development.



Photo, Courtesy, Textile-Finishing Machinery Co.

Figure 3

One of the most recent of these is shown in Figure 3. This is a special air-dryer for low-temperature drying on special printed silk and synthetic fiber fabrics. This dryer requires no auxiliary power and is mounted above the printing machine on a mezzanine. All carrier rolls are arranged on X-frame for maze threading, and the maximum contact of the fabric with the unprinted side touching the face of the rolls.

Figure 4 shows a special cylinder-type print dryer, ball-bearing throughout with an off-set type cylinder mounting for sheer fabrics. This was developed recently for one of the well-known Eastern printers.

The increased speed of printing machines has necessitated the introduction of devices for more efficiently handling the guiding of goods into the back of the printing machine. One of these is illustrated in Figure 5 and is said to keep any fabric in alignment within plus or minus 1/32 of an inch, providing the edge of the fabric is good enough to control the guiding.

Another attachment which has proven of good value on the printing machine is a lamp with reflector, making

(Continued on page 542)

Peroxide Bleaching

A Report of Developments and Progress During the Past Several Years

H. G. SMOLENS*

FOR the past five years the percentage of the total usage of peroxide for textile bleaching has become more and more a matter of cotton bleaching. It looks as though this trend will continue for some time in the future. Therefore, most remarks and comments to follow pertain to the bleaching of cotton materials.

The peroxide bleaching of cottons has just about completed a third phase of its existence. The first, or embryo phase, ending in 1928, consisted mainly of efforts to get bleacheries, except those already processing silks and woolens, to try peroxide bleaching. A special attempt was made during this phase to put peroxide bleaching of all kinds on a more or less scientific basis. All kinds of extravagant claims and promises were made for the advantages of peroxide in bleaching, some of which seem quite ridiculous according to present knowledge and experience. It is somewhat surprising and quite complimentary to the intrinsic merit of peroxide bleaching that it was able to survive this period at all.

The second phase, ending about 1934, consisted of trying to produce in a second or third bleachery what seemed like a fairly good job in the first. During this time it was discovered that peroxide bleaching could be done on practically every type of cotton fabric or material, by following the customary bleachery routings. As a result, the yardage of cotton goods, peroxide bleached, took a very large jump during the second phase.

About 1930 or 1931 it began to dawn on some of us that in order to bring out the value of peroxide bleaching to its fullest extent it would be necessary, if possible, to develop new routings, new combinations of peroxide bleaching chemicals, new types of equipment. Therefore, while the position of peroxide bleaching was being consolidated quite substantially during the third phase of its existence, 1934 to 1939, entirely new ideas of bleaching with peroxide were being developed, both in the laboratory and in the bleachery. As soon as a newly developed process showed possibilities it was quietly turned over to a selected single bleachery or group of bleacheries. Quite a few of these new processes have been in large use, with excellent results in every respect, for at least several years.

The reason why so little has been published about these new developments thus far is that a fairly large number of them have been and are being patented. Their basic ideas are already covered by U. S. Patent No. 2,029,985 and U. S. Patent No. 2,107,297. Now it looks as though we are ready for a new phase of peroxide bleaching in which some of the present methods will be greatly improved upon or entirely superceded. However, it is to be hoped that because new ideas are available, we will not go through another embryo period of extravagant promises and claims.

The outlines of some of these newly developed processes of peroxide bleaching that follow are necessarily somewhat sketchy, but detailed information is available to almost everyone further interested.

SILK

Silk fabrics of all kinds, including tussahs, are being safely and economically bleached by saturating them with a suitable peroxide solution at room temperatures and then steeping them in boxes or on rolls for from two to twelve hours. An ordinary washing completes the process, which allows very large production possibilities with a minimum of equipment and handling. This process may be used either on degummed or scoured goods or on raw goods, depending on individual conditions.

WOOL

(Stock, Top, Yarn, Woven or Knit Goods, Felt)

All kinds of wool materials are being bleached in a manner similar to that outlined for silk. There is no loss in quality, especially spinning and finishing quality, from the reactions taking place during this kind of bleaching.

A rather ingenious process is available for makers of wool felt hats. The bodies are fulled as usual, but are also given a special alkali treatment before removal from the bumper. They are then saturated with a suitable peroxide solution at room temperature and allowed to steep in bins or boxes for about six to twelve hours. This process allows any kind of a white desired without any loss in quality, especially further shrinking quality, at a fairly low cost both in handling and chemicals, with a real minimum of seconds.

COTTON

Colored Yarn Goods

The several reasons for the really wide use of peroxide bleaching on colored yarn fabrics are, 1st, the fastness of most colors, except naphtols, to the usual peroxide kier boil; 2nd, the simplicity and ease of handling of the goods throughout the process and the superiority of the finishes possible; 3rd, the cleanness of the bleached goods and their freedom from unbleached motes. A passable bleach can be given almost all kinds of colored yarn fabrics in a single peroxide kier boil, after some sort of a desizing or scouring treatment, but, until about two years ago, two boils or their equivalent were necessary for really first class work. Now, a new process, consisting of a peroxide treatment at the singer, a steep in the grey bin and a single peroxide

*Buffalo Electro-Chemical Co., Inc., Buffalo, N. Y.

kier boil, is producing a magnificent bleaching job at very reasonable costs, with large production possibilities, but without expensive additions or changes to existing equipment.

As a result of some very interesting work, during the several years last past, on colored yarn fabrics containing naphtol dyed yarns, it looks as though a satisfactory peroxide bleaching process for this class of work is quite possible. This is being tested out on a fairly large scale, but will not be available for general use until at least two years of successful bleaching have been accomplished.

White Goods—Light Weight

With a very few exceptions for special purposes, the conventional caustic boil followed by the peroxide bleach boil, is still the most economical peroxide bleaching process in bleacheries that have plenty of kiers, washers and auxiliary equipment. For new bleacheries or for those that need additional production, a few variations of the new process outlined for colored yarn fabrics will produce excellent results at costs comparable with those of the conventional process.

There has been a great deal of inquiry lately on a "new" continuous bleaching process with peroxide, for light weight goods. There is nothing new about continuous peroxide bleaching. Various attempts were made before 1929 to do such continuous bleaching on a battery of slack washers, but the costs, both chemical and operating were much higher than those of the comparable kier bleaching processes. In 1930 a large continuous bleaching J box unit was tried out fairly extensively in the south. It could have been made to produce satisfactory work, but it was discovered quite early that the bleaching costs would be far higher than the comparable kier bleaching costs, so the project was abandoned.

In 1936 there was issued by the U. S. Patent Office the first and basic patent covering a process of continuous bleaching with peroxide. This process very simply saturates cotton goods with a suitable peroxide solution, and subjects the saturated goods continuously to a temperature over 212° F. for any desired length of time. Some goods can be bleached by this process, in five minutes or less, at from 60 to 100 yards per minute, right from the grey, without any preliminary treatment whatsoever, at steam pressures of 20 to 50 lbs. Other goods can be bleached by this process, also from the grey, at temperatures of 140° or 180°, in about an hour, running 60 to 150 yards per minute.

All goods, however, must be subjected to pretty high temperatures, even though for a very short time, in order that they will be heated to 140° or 180° or 210°, as desired, at 60 to 150 yards per minute running speed. Otherwise the equipment necessary would be extremely large and its cost prohibitive.

Goods that have been kier-boiled with caustic, or scoured in tight or slack washers, or otherwise prepared for bleaching, can be bleached at 212° under this patented process at much higher speeds, and without any steeping at all.

There is no particular problem in producing, continuously, a satisfactory fabric bleach which is also free from unbleached motes. There is, however, quite a problem in producing an acceptable bleach by a continuous process at costs at least equal to the present low costs of the other processes that are not so-called "continuous." A really continuous process for a bleachery is one in which the material or materials to be bleached would start from the grey room and, at uniform speeds, move right along to the finishing room without any stops at all, except for possibly some slack between two machines. It is not quite a simple matter to synchronize singeing, mercerizing, souring, washing, scouring, bleaching and drying at costs of equipment, power, steam, labor, chemicals, etc., comparable with those of present routings. This is further complicated by the fact that different fabrics may require different routings at different speeds, so that a separate continuous bleaching unit might be required for each type of goods to be bleached.

A typical peroxide bleaching range for continuous operation, running on four yard goods at 100 yards per minute in the rope, and allowing three shift operation, will produce about 120,000 yds. or 30,000 lbs. of bleached goods per day. One such range requires several slack rope soapings and washings ahead of the bleaching unit itself, a scutcher, an open width saturater for the peroxide solution, a high temperature preheating device to bring the saturated cloth up to the desired bleaching temperature, a suitable container to steep the hot saturated cloth for the desired length of time to complete the bleaching, and more slack rope washings after the bleaching. The installed cost of such a range would be about $25,000 and any saving in labor, power, steam or chemical cost over present processes is problematical.

Several peroxide bleaching installations are producing the same 120,000 yds. or 30,000 lbs. of four yard goods per day, operating under another one of the new processes outlined, with two rope washers, three grey bins, one open width peroxide saturating machine and three open boil peroxide kiers, three ton capacity. The installed cost of such a unit is not over $10,000 and all of the operating costs are considerably lower than those of the continuous range outlined above. Furthermore, the equipment cost for changing over a bleachery already supplied with kiers, washers, etc., to this new process is almost negligible.

White Goods—Heavy Weight

A fairly large yardage of goods such as drills, ducks, gabardines, twills and various narrow sheetings, have to be half bleached for dyeing, in the open width. This bleaching has always been a problem and a nuisance in the average bleachery. Since 1933 some of this yardage,

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The Research Associateship of

The Textile Foundation

at the National Bureau of Standards

WARREN E. EMLEY

THE Textile Foundation was incorporated by Act of Congress (Public No. 329, 71st Congress) in 1930, to expend certain funds "for scientific and economic research for the benefit and development of the textile industry * * *." During the years since then, the Foundation has accomplished results of major importance in both the scientific and economic fields and the allied field of textile education. By 1937, the experience gained in scientific research led the Directors to decide that the funds could be spent to the best advantage to the industry (1) if the efforts were confined to the solution of fundamental problems, leaving "applied research" to other agencies; (2) if the work were concentrated at one place; and (3) if it were put under the immediate supervision of a qualified advisory committee. These decisions did not mean that the scientific and technical research then under way at various places should be summarily discontinued, nor that any changes should be made in the set-up for economic or educational research.

During the year ending June 30, 1939, two research projects have been completed and eight others started, all dealing with the fundamental properties of textile fibers. The selection of the present staff of fourteen has occupied much of the time of the Technical Advisory Committee.

Early in 1938, the first action was taken by the appointment of the Advisory Committee for Scientific Research. This committee consists of Dr. Robert E. Rose, of E. I. du Pont de Nemours & Co., Inc., as chairman; Mr. Alban Eavenson of Eavenson & Levering, wool scourers; Dr. Harold deW. Smith, of A. M. Tenney Associates, a rayon specialist; Dr. Hugh S. Taylor of Princeton University; Dr. R. Y. Winters of the U. S. Department of Agriculture, and the writer.

The second action was to select the National Bureau of Standards as the place at which the work should be concentrated. The third action was a decision that, for a while at any rate, the work should be confined to a study of the fundamental physical and chemical properties of fibers—wool, silk, cotton, and rayon.

While the first man was employed on May 1, 1938, it was agreed that the fiscal year would begin on July 1, to coincide with the fiscal year of the Federal government. At the close of the first fiscal year, it seems appropriate to take account of stock.

The Advisory Committee has spent a great deal of time settling the innumerable details which arise in connection with such a development, building up a staff competent to handle the work, and giving careful study to the details of each research project proposed.

Since the contemplated work has to do with both physical and chemical properties, it seemed best to attack each project from several different points simultaneously: an organic chemist, a physical chemist, and a physicist, working together on the same problem would be more likely to arrive at the true solution than would any one of them working alone. The selection of the right men for the staff has therefore been a matter of major concern to the Committee.

Fortunately, Dr. Milton Harris (Ph.D., Yale, 1929) was available for appointment as the leader of the group. He had been studying the chemical composition of wool as a research associate for the American Association of Textile Chemists and Colorists at the National Bureau of Standards since 1931; and was merely shifted to the new payroll.

Dr. Jacinto Steinhardt (Ph.D., Columbia, 1934) and Dr. Leland F. Gleysteen (Ph.D., Brown, 1936) have been appointed as physical chemists; Dr. Wilbur I. Patterson (Ph.D., Illinois, 1934) as a protein chemist; Dr. Roy L. Whistler (Ph.D., Iowa State, 1938) as a cellulose chemist, and Dr. Lester C. Lewis (Ph.D., Hamburg, 1931) as physicist. These leaders have three associates, four assistants, and a part-time clerk.

The work under way at present may be classed in three groups: (1) Studies of the chemical nature of fibers, such as "Study of the reactive groups of silk," "Acidic and Basic Properties of Silk, Wool, and Cellulose," "Polyuronides in Cellulose." (2) Studies of the physical nature of fibers, such as "Electrophoretic Properties of Fibers." "Cell Structure of Wool," and (3) Studies of the reactions of external agents on fibers as a means of learning more about the fibers, such as "Photochemical Decomposition of Wool," "Effect of Reducing Agents on Wool," "Effect of Oxidizing Agents on Cellulose."

Two research projects have been completed during the year. A report on the Base-Combining Capacity of Wool was published in the Journal of Research of the National Bureau of Standards for May, 1939[1], and one on Electro-

[1]Am. Dyestuff Reptr., May 29, 1939, p. 293.

phoretic Studies of Silk[2] appeared in the same journal in August[3].

In the former report, it is stated that:

"Wool fibers are principally composed of protein substances which contain chemical groups having acidic and basic properties. The state of combination of these groups is intimately related to the ability of the fibers to absorb moisture and dyes, to their elastic and tensile properties, and to their ability to withstand deterioration.

"The most direct method for determining the number of these groups involves the determination of the amount of acid or base bound by the material. Because of the inherent nature of the wool, little difficulty has been encountered in measuring the amount of acid taken up. On the other hand, wool is so unstable in alkaline solutions that the amount of base combined has never before been determined by direct titration.

"The results of this investigation show that the failure of wool to reach equilibrium with the alkaline solutions was due to the reaction of the base with the disulfide groups of the cystine. From the data, it was possible to determine the extent of this reaction, and make suitable corrections for it. When this was done, it was found that although the apparent base-combining capacity increased with increasing duration of contact of wool with alkali, the intrinsic base-combining capacity became constant after approximately 1 hour.

"The data also afford confirmation of the earlier observation that the alkaline degradation of wool involves the splitting of the disulfide groups and a subsequent loss of one sulfur atom from each cystine molecule."

A summary of the second report is:

"One of the principal difficulties involved in defining many of the characteristics of silk results from the fact that the natural-occurring fibers consist of at least two proteins, silk fibroin and silk sericin, which have very different properties. In order to determine the extent of removal of sericin from fibers during degumming, and also to determine some of the characteristics of both proteins, a micro-electrophoretic technique was used. The results of investigations show that sericin contains a much greater portion of reactive groups than the fibroin, and indicate the necessity for obtaining either uniform or complete removal of the sericin during the degumming process.

"The isoelectric point of the fibroin was found to be at pH 3.5, and that of sericin at pH 4.3. Large ions of complex structure such as phthalate or picrate appear to be taken up by the fiber in such a fashion as to considerably alter its surface characteristics."

These examples illustrate the philosophy back of the program: To concentrate on a study of the fundamental physical and chemical properties of textile fibers, and to attack each problem from the viewpoints of several men having scientific training in different fields.

The program is being pushed in the belief that the future progress of the textile industry is largely dependent upon having available complete information about the composition and structure of the textile fibers.

[2]Am. Dyestuff Reptr., August 7, 1939, p. 412.

[3]Under cooperative arrangements, these reports appear simultaneously in other journals, such as American Dyestuff Reporter, and Textile Research. Reprints may be obtained from the Textile Foundation, Inc., Department of Commerce Building, Washington, D. C.

Peroxide Bleaching—

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growing larger each year, has been bleached with peroxide by simply running the grey goods through a suitable peroxide solution at room temperatures at speeds up to 150 yards per minute, plaiting down in boxes or rolling up on shells, steeping from 4 hours to 12 hours and washing in open width washing machines. Most of this cloth is bleached without even desizing, in order to reduce finishing costs, especially when the cloth has to be finished to grey goods weight. Since early in 1938 this process has been made continuous by introducing a steaming device between the saturating machine and the washer, so that it is now possible to have goods ready for dyeing within 30 minutes after they have come into the bleach house. When heavy weight goods are ordered into white, their preparation is exactly as for the half bleach outlined above. Then the cloth is either given a second run through the continuous process, or put on a jig for a short hot bleach.

RAYONS (Viscose or Acetate) (Filament or Spun)

Rayon piece or knit goods are being peroxide bleached by saturating them, right from the grey, with a suitable peroxide solution, steeping them overnight at room temperature, or steaming them for about ten minutes continuously, then washing and drying on the usual range. Both full whites and half bleaches for dyeing are being produced in this manner.

Although most of the new processes of peroxide bleaching outlined heretofore are being used on existing equipment, with quite satisfactory results, it is probably best that new stainless metal machinery be used wherever possible, from the standpoints of economy and cleanliness. Like other peroxide bleaching processes, they are limited in their effectiveness by local bleachery conditions, and their comparable costs vary from plant to plant. As more experience in their application is obtained, it is possible that additional routing or equipment changes will be indicated.

At any rate, there has been very considerable development in peroxide bleaching during the past several years, resulting in these new processes. Most of them are available to bleachers right now, others will be, within the next year or two.

Yarn and Fabric Trends

in Europe and America

H. WICKLIFFE ROSE**

AS the guest of a technical group I am truly a visitor. In fact, it is as a visitor that I hope to justify taking your time at this meeting. I am sure we have all had the experience of an out-of-towner taking us the rounds of our city and showing us places we had always intended to get around to some day, and finding others that we did not know existed right within easy reach. I am sure many New Yorkers will see the World's Fair for the first time when out-of-town friends arrive all primed to go, and will see it probably many times again under the same conditions. Each visitor will have different interests, and the host even on the seventh visit, will probably be directed, or dragged, by his enthusiastic guest to pavilions and exhibits that are new to him.

And so, as a visitor in your technical field where I do not pretend to know my way around, I hope that you will indulge my pointing with enthusiasm to the features that interest me, and in covering ground already familiar to you, I hope that you may find some points of new interest.

TECHNOLOGISTS' PLACE IN THE INDUSTRY

Certainly the technologists, of all textile men, are in position to discriminate between various points of interest in their field. In fact, discrimination, when one comes to think of it, is part of your purpose and one of your prime functions. What a mass of facts, and what a world of material is yours to explore! And the rest of us, conscious of the overwhelming amount of existing material, much of it colored by pride and prejudice, and conscious of the vast number of unanswered questions waiting to be explored, look to the discrimination of the textile technologists to tell us what is good of existing material, and what answers should be sought next.

During the World War a second title to a war song called for an ironic kind of discrimination. Some of you will recall that during the early fever of patriotism a song emerged called, "Don't Bite the Hand That's Feeding You." Then when the boys found themselves on a steady diet of war rations they sang instead, "Don't Bite the Food They're Handing You." Of course it was in fun, and no one starved that I have heard of, but the point here is that without being disloyal to the interest which gives you your livelihood you can still, and are expected to, discriminate in accepting the material that is handed you, and reject, not that which is merely distasteful, but that which is indigestible. Just as surely as an army travels on its stomach so does the textile trade, and no one is going to profit by materials that cannot be assimilated.

In the manufacture of textile products the scientific viewpoint is maintained rather consistently. In the sale of the same products, however, the wish can father many thoughts, and expediency, pressure, and unguided enthusiasm can lead to forms of ballyhoo which sometimes hides the facts or distorts them until they are no longer recognizable. In your neutral position you have the privilege of sorting out the facts from the pseudo-scientific presentation of a welter of material, and in so doing you help the whole industry and trade to keep a perspective.

And perspective is what we need most today in studying rayon yarn and fabric trends in Europe and America. In order, then, to gain a perspective on the number of new products ar ! the current trends, let us examine first what the rayon industry is doing and why.

RAYON INDUSTRY IN GERMANY

In Germany there is tremendous activity on rayon staple fiber for a very definite purpose and under a very definite plan. In fact the plan is so clear and concise that, regardless of our personal opinion of their politics or methods, it will be worth while to study it for a moment.

The entire rayon industry in Germany is controlled by one man, Herr Kehrl, who has the powers of a dictator. A plan has been worked out to fit in with the broader plans of the national economy, and it has now been in operation for some time. The plan is divided into three phases, each simple in itself but only possible for complete operation in a country where costs, prices, wages, the value of currency, and the production and sale of goods is under complete control.

The first phase is for quantity production. We know that that phase has been successful for Germany has an annual production of approximately 400 million pounds of rayon staple fiber at present. This first phase has enabled the industry dictator to decree that fabrics shall contain a certain percentage of spun rayon, replacing natural fiber, cotton, or wool, which otherwise would have to be bought abroad. The percentage decreed requires just about the amount of staple now that the country can produce, although it both exports and imports staple at present. The staple is required in fabrics where it is con-

*Presented before American Association of Textile Technologists, June 7th, 1939.

**American Viscose Corporation.

sidered suitable, and the percentage is estimated with the thought of not placing more burden of serviceability on the rayon than it can bear.

The second phase is one of research and experimenting to improve the technical qualities of rayon. The purpose of this phase is mainly to bring up the strength of the fiber to a point where it can replace more or all of the natural fiber and then to raise the percentage by decree. While this second phase of research is in progress at the present time, the first continues, and the production of 400 million is being raised to a capacity of 600 million pounds of staple fiber by the end of 1940.

The research is required of every producer by the industry dictator, who has stipulated a certain percentage of income which must be devoted to that purpose. While "hochnassfest," or high tenacity is the principal aim, diversification is another, and a great number of yarns and staple fibers are offered with various characteristics for a number of different fabric uses.

The third phase is planned for low costs and low prices. Rayons are high priced in Germany today, but it is figured that when the high tenacity makes it possible to decree a greater percentage, and when varied types broaden the uses of staple fiber, production will be at a rate which will give lower costs, and prices, which are set by the industry dictator, can then be lowered. The lower prices should also have the reciprocal effect of broadening the market for rayon and insuring consumption of the increased production. Incidentally, if the home market does not consume the tremendous production in prospect, it will be forced into foreign markets, by barter or subsidy and will become an additional threat to industries which ordinarily operate on an economy of free competition between fibers, and to countries which have natural fiber crops.

As a part of the second phase of the rayon industry in Germany testing and experimental textile units have been set up. In Berlin there is a testing laboratory for the whole industry, Material Prufungs Anstalt. It is used not only for periodic tests by all producers to check their progress on developments and production but tests are required for the information of the industry dictator to check the activities of all producers.

In Wuttemberg there is a cotton and worsted experimental spinning plant, "Lehrspinnerai," which is also open to all producers. If a sample is going through a commercial mill, a control sample of the same lot is sent through this unit to check the results. If problems of technique are involved the machinery manufacturers may be called in to encourage the development of new machinery for particular purposes.

In working on this research, development, and general improvement of rayon, they have felt the necessity for a quality control plan, and are now in process of evolving one. It is interesting to note that they have found tests of staple and yarn to be insufficient to tell the story of fabric quality. They have found also that tests of greige goods are not sufficient, and that only finished materials can be made the basis of quality control standards. When the plan is complete and standards are established it will, of course, be on the industry-wide basis.

THE RAYON INDUSTRY IN ITALY

In Italy the same economic factors exist, with the same pressure on the textile industry to make and use rayon instead of the natural fibers. The difference is that, while there is governmental control of all industries, there is not the industry dictatorship nor the industry unified plan. Each company works out its own plans for production and technical developments, while the government helps with the markets.

IN ENGLAND AND THE UNITED STATES

In both England and America rayon yarn and staple fiber take their place in free competition with the natural fibers without government pressure holding back one to help another. It is thought that the pending Cotton Act in England may react to the detriment of rayon; and in this country, with an avowed policy of taking from industry to give to the farmer, the threat of a processing tax is revived from time to time; but all in all the fibers stand on their own feet in both countries and compete on their own merits.

It is interesting then to ask, "Under these conditions, in what phase is the rayon industry of England and the United States as compared to Germany?" A study of progress made in the two English-speaking countries indicates that without industry dictatorship, without concerted plans of the various producers, rayon has gone through a period of expansion and is now involved in concentrated technical development. The danger to staple fiber in the United States is that the third, or low price, phase may be forced by competition from low priced European staple before the second phase has been completed. The wisest part of Germany's plan seems to be the recognition of the principle that an industry cannot conduct research and development if sufficient return is not permitted on the product. The dangerous part of the program is that while maintaining prices at home they want to dump their product abroad.

These economic conditions are of interest in appraising fabric development in the various countries. In the dictator countries we find a large number of fabrics in which rayon is used purely for substitutions. For instance, oil cloth is made of rayon instead of cotton, whereas in this country there would be no point in using rayon in a material that would hide its usual merits without taking advantage of any of them. Many constructive fabric designs are to be found in each country and we must discriminate between that which is merely new and different and that which will contribute something to the market here.

CHARACTERISTICS

The concentrated research in the world rayon industry has brought about a number of interesting developments. Aside from the new types of synthetic yarns and fibers,

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Recent Developments in the Chemistry of

Silk and Silk Processing

WALTER M. SCOTT, Ph.D.*

INTRODUCTION

A CURIOUS situation has been developing in the silk industry during the past year. Although the total consumption of raw silk in this country has remained at about the same level, 25,400,000 pounds for the first 6 months of 1939 as compared with 25,000,000 pounds for the corresponding period in 1938, the price has been climbing rapidly since the first of the year. In June of this year, spot silk was quoted at about $2.50 per pound, which represented an increase of about $0.75 per pound over the January quotations.

There are said to be two causes for this price increase: (1) a decrease in the production of silk in Japan because of war conditions and the uncertainty of the United States market, and (2) an increase in the Japanese consumption of silk. The consumption of raw silk in Japan amounted to 246,280 bales for the first nine months of the current season beginning July 1, 1938, as compared to 203,759 bales for the corresponding period of the previous season.

With the price of silk holding at a level about five times as high as the average price of rayon, there has been in this country a continued replacement of silk by rayon in all textile products except hosiery. This has resulted in a still greater dominance of hosiery in the silk field, a trend which has been noted in the last two reviews of this series. According to figures obtained from the Commodity Exchange by the *Rayon Organon*, hosiery consumed as high as 89 per cent of the total amount of silk used in this country in May, 1939, whereas at the start of the year hosiery accounted for only about 73 per cent of the total.

There has been a gradual, though still slow, development during the past year in the production of nylon, the synthetic polyamide fiber resembling silk. The superior wearing qualities of hosiery made from nylon are being demonstrated by the manufacturer at both the San Francisco and the New York World's Fairs. It has been stated that the tensile strength of nylon averages about 5.2 grams per denier, as compared with 4.0 grams per denier for silk and 2.0 grams per denier for cotton. Furthermore the wet tensile strength of nylon is at least 85 per cent of the dry strength.

Nylon fibers are relatively insensitive to moisture. They are said to have a regain of about 1 per cent as compared with 11 per cent for silk. Although this property is a distinct advantage in actual use, it tends to complicate the dyeing problem. Nylon can be satisfactorily dyed in baths containing certain types of dispersed dyestuffs which were developed for the coloring of cellulose acetate. However, the dispersed particles must be exceedingly fine to penetrate the nylon fibers because of their lack of swelling in the aqueous solution.

Hosiery is not the only filed in which nylon is threatening to compete with silk. Recently a type of sewing thread, called Neophil, has been placed on the market. This is made entirely from nylon fibers and is said to be characterized by great strength and elasticity, ability to withstand repeated launderings without injury, resistance to moisture and perspiration, and resistance to abrasion and wear. Thus silk continues to be threatened in the few fields in which it is still active.

This article is the sixth in a series of reviews which have appeared in this journal under the same title. These reviews summarize the progress which has been made in the fundamental chemistry of the silk fiber and in the chemical processes which play a part in the transformation of the raw silk into the finished product. The previous articles have covered the developments prior to November, 1938. The present review brings the story up to September, 1939. For purposes of clarity the subject is divided into four chapters as follows:

1—The Chemistry of Silk.
2—The Preparation of Silk.
3—The Dyeing and Finishing of Silk.
4—The Processing of Silk Hosiery.

CHAPTER 1
THE CHEMISTRY OF SILK

The Chemistry of Fibroin

A very complete review of the chemical and physical aspects of textile fibers, including silk, has recently been published by Jerome Alexander who considered the fibers at the following structural levels:

1—Atomic—dealing with the chemical elements.
2—Molecular—comprehending the main molecular constituents.
3—Macromolecular—referring to the linear "giant" molecules or valency chains.
4—Micellar—the so-called "Crystallites" resulting from apposition of linear molecules.
5—Microscopic—dealing with fibrils.
6—Visible—including fibers, threads, yarns and fabrics.

The atomic elements found in silk are of course carbon, hydrogen, oxygen and nitrogen. The molecular constituents of fibroin are determined by hydrolysis and have

*Gustavus J. Esselen, Inc., Boston, Mass.

been the subject of study by numerous investigators over a period of many years. The latest investigation along this line was made by Bergmann and Niemann who reported that the following percentages of amino acids were obtained from fibroin: 43.8 per cent glycine, 26.4 per cent alanine, 13.2 per cent tyrosine, 0.95 per cent arginine, 0.25 per cent lysine and 0.07 per cent histidine. The figures for glycine, alanine and tyrosine are slightly higher than those obtained earlier by Abderhalden and are probably more accurate because of improved analytical methods in which glycine is precipitated by potassium trioxalatochromate, and alanine by sodium dioxypyridate.

It is now possible to conjecture the macromolecular structure of fibroin on the basis of the above analysis. The following table indicates the frequencies and ratios of the above amino acids which comprise about 85 per cent of the fibroin molecule.

Amino Acid	*Frequency*	*Ratio*
Glycine (G)	2	1296
Alanine (A)	$4=(2^2)$	648
Tyrosine (T)	$16=(2^4)$	162
Arginine (Ar)	$216=(2^3x3^3)$	12
Lysine	$648=(2^3x3^4)$	4
Histidine	$2592=(2^5x3^4)$	1

This means that every other molecule in the fibroin structure is glycine, every fourth molecule is alanine, etc. In other words, there are 1296 glycine molecules and 648 alanine molecules to 1 molecule of histidine. As mentioned in last year's review, Bergman and Niemann calculated that the minimum molecular weight of fibroin must be approximately 217,700. They have further suggested the following structure for a portion (i.e. one-sixth) of the fibroin molecule, in which X stands for amino acids other than those whose abbreviations are given in the above table:

-G-A-G-T-G-A-G-Ar-G-A-G-X-G-A-G-X-
$(G\text{-}A\text{-}T\text{-}G\text{-}A\text{-}G\text{-}X\text{-}G\text{-}A\text{-}G\text{-}X\text{-}G\text{-}A\text{-}G\text{-}X)_{12}$-
G-A-G-T-G-A-G-X-G-A-G-X-G-A-G-Ar-
$(G\text{-}A\text{-}G\text{-}T\text{-}G\text{-}A\text{-}G\text{-}X\text{-}G\text{-}A\text{-}G\text{-}X\text{-}G\text{-}A\text{-}G\text{-}X)_{13}$-

It has been estimated from x-ray data that the distance between adjacent peptide bonds in fibroin is 3.5 Ångstrom units, which indicates a minimum length of 907.2 millimicrons (almost 1 micron) for the fibroin macromolecule. However, Alexander reported that in his examination of silk under the ultramicroscope, the size of the ultramicrons appeared to be much smaller than 0.9 micron.

The micellar structure of silk is not yet clearly understood but it is thought that chains of the long macromolecules are bound together by thin molecular layers of a different nature or structure. The swelling of fibroin in hot concentrated solutions of calcium chloride, calcium thiocyanate, etc., has been studied by von Weimarn under the ultramicroscope. He found that the silk fiber appeared to divide into a large number of fibrils which were ultramicroscopic in size. The fibrils in a swollen thread appeared to be distributed spirally, and the stronger the swelling, the tighter the spirals. With extreme swelling, the silk assumed a rubber-like state. It is assumed that some such swelling takes place during the formation of the silk in the silkworm, which may account in part for its elasticity.

Several Japanese investigators have studied the silk from the cocoons of *Eriogyma pyretorum* and *Theophilia mandarina*. The fibroin was hydrolyzed with a 25 per cent solution of sulfuric acid and the resultant amino acids were separated and determined in the usual way. It was shown that the amino acid composition of these two types of silk was essentially the same as that of silk from the common silkworm, *Bombyx mori*.

Fibroin Solutions and Reactions

The acetylation of fibroin by the action of ketene gas has been mentioned in several previous reviews. This investigation was carried out by Carr and during the past year the same investigator reported upon the acetylation of fibroin with acetic anhydride. At room temperature, pure acetic anhydride acts very slowly on silk fibroin. The acetyl (CH_3CO) content is only 3.5 per cent after 72 hours. Between room temperature and 75° C. the rate increases slowly, but from 75° C. to the boiling point of acetic anhydride(i.e., 137° C.) the rate increases more rapidly.

At 125° C. the fibroin is acetylated to the extent of about 7 per cent acetyl content in 20 to 30 minutes and there is very little change in its original white color. The acetylation does not increase appreciably with longer treatments at the same temperature but the silk becomes more and more discolored. It was determined that the initial action of the acetic anhydride involved a simple acetylation of the free, active amino groups. The hydroxyl groups of the tyrosine molecules appeared to be quite difficult to acetylate. The use of anhydrous sodium acetate served to increase the speed of the reaction but did not appreciably raise the degree of acetylation.

A new use for solutions of silk fibroin has been claimed in a recent United States patent. Solutions of the fibroin or of other proteins in benzyl trimethyl ammonium hydroxide, or other substituted quarternary ammonium bases, are utilized as spinning solutions in the manufacture of synthetic fibers. It is said that these solutions have the property of retaining their viscosity on standing for relatively long periods of time at room temperatures.

A study has been made of the swelling which takes place in raw and boiled-off silk when it is immersed in distilled water at room temperature. This supplemented an earlier investigation of the swelling of silk fibroin in air at relative humidities up to 100 per cent. In the recent study, the swelling was determined by measurements of the diameter under the microscope, first in air and then in water. It was found that the swelling of fibroin was in inverse ratio to the original diameter in air, i.e., as the diameter increased from 8 to 16 microns, the swelling in water decreased from 143 per cent to 111 per cent.

On the basis of a large number of measurements in air it was determined that the average diameter of the silk

(Continued on page 546)

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

SEPTEMBER 4, 1939

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Eavenson & Levering Co., Camden, N. J.

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Lowell Textile Institute, Lowell, Mass.

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HOMER WHELCHEL (South Central)

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North Carolina State College Student Section

W. L. Carter, Chairman; Seymour Schandler, Secretary

Philadelphia Textile School Student Section

Bernard Menin, Chairman; Ruth Chartener, Secretary

Members should notify the **Secretary** immediately of all address changes

Report of the

Nominating Committee

UNDER the new Constitution the Nominating Committee consists of the Councilors Representing Sections, listed in the American Dyestuff Reporter on the page headed "Proceedings." Mr. Eavenson requested that he be not considered for a third nomination. The Committee has directed the Secretary to report the following nominations:

For President—Carl Z. Draves.

For Vice-Presidents—Duncan Ferguson and Arthur R. Thompson, Jr.

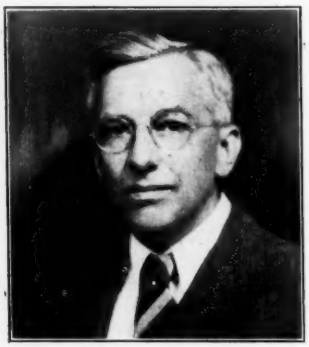
Under the Constitution, additional nominations, each signed by at least twenty-five Senior Members, filed with the Secretary not later than October eighth, will be given equal standing on the ballot.

Respectfully submitted,

HAROLD C. CHAPIN, Secretary.

ALBAN EAVENSON
President

ARTHUR R. THOMPSON, JR.
Vice-President



HAROLD C. CHAPIN
Secretary

CARL Z. DRAVES
Chairman, Technical Program Committee

ANNUAL MEETING

BOSTON, MASS.

Program

FRIDAY, SEPTEMBER 15

9:00 A.M. Registration Opens in Lobby of Copley-Plaza Hotel.

9:30 A.M. One Hundred and Twenty-fourth Council Meeting.

11:00 A.M. One Hundred and Seventeenth Meeting of the Research Committee.

12:30 P.M. Luncheon for Council and Research Committee.

2:00 P.M. Bridge Tournament for Visiting Ladies.

2:00 P.M. First Technical Session in Grand Ballroom. "The Dyeing of Nylon—A Preliminary Survey" by PHILIP H. STOTT of *E. I. du Pont de Nemours & Co.*

2:25 P.M. "Progress in Research from the Consumer Point of View" by DR. PAULINE BEERY MACK of *Pennsylvania State College.*

2:55 P.M. "Identification of the Newer Textile Fibers" by JOHN H. SKINKLE of the *Lowell Textile Institute.*

3:15 P.M. "Semi-Resin Finishes for Cotton Piece Goods" by W. W. TROWELL of the *Hercules Powder Co.*

3:40 P.M. "Flexibility and Drape as Measurable Properties of Fabric" by L. J. WINN, A.A.T.C.C. Research Assistant, and DR. EDWARD R. SCHWARZ of the *Masscahusetts Institute of Technology.*

4:15 P.M. "Tintinoil Process" by EDWARD H. SCHMIDT of the *Borne Scrymser Co.*

4:35 P.M. "A New Type Water Repellent" by GEORGE A. SLOWINSKE of *E. I. du Pont de Nemours & Co.*

5:00 P.M. "Textone—A New Oxidizing Agent for the Treatment of Textiles" by A. L. DUBEAU, J. D. MACMAHON and G. P. VINCENT of the *Mathieson Alkali Works.*

Under Auspices:

Northern New England Section

NGND CONVENTION

SEPTEMBER 15 and 16

6:30 P.M. Buffet Supper for Members and Visiting Ladies in Grand Ballroom.

8:00 P.M. Official Welcome to the Convention and ANNUAL BUSINESS MEETING.
Entertainment.

SATURDAY, SEPTEMBER 16

9:30 A.M. "Microscopic Observations of Wool Dyeing" by H. E. MILLSON, G. L. ROYER and G. E. WISSEMANN of the *Calco Chemical Co.*

9:55 A.M. "A Motion Picture Study of Some Dyeing Phenomena" by R. H. KIENLE and G. L. ROYER of the *Calco Chemical Co.*

10:10 A.M. "Sodium Sulfate Error in Measuring the Acid Content of Carbonizing Baths" by H. C. OLSEN and W. B. PRESCOTT with DR. H. C. CHAPIN of the *Lowell Textile Institute.*

10:20 A.M. "New Concepts in the Chemistry of Wool" by DR. MILTON HARRIS, Director of Research for the *Textile Research Associateship at the National Bureau of Standards.*

11:00 A.M. "The Present Status of Casein Fiber" by E. O. WHITTIER and S. P. GOULD of the *Bureau of Dairy Industry.*

11:25 A.M. "Surface Cation Active Compounds in the Textile Industry" by JACOB KATZ of the *Warwick Chemical Co.*

11:45 A.M. "The Development of Methods for the Determination of the Causes of Damage Appearing in Wool after Dyeing" by BERTIL A. RYBERG, Research Associate of the *A.A.T.C.C. supported by the Textile Foundation at the Lowell Textile Institute.*

12:10 to 12:30 P.M. "Modern Dyeing of Staple and Spun Viscose Rayon" by CHARLES B. ORDWAY of *American Aniline Products.*

12:45 P.M. Luncheon for National and Sectional Officers Only.
Afternoon: Sightseeing Trips.

7:00 P.M. BANQUET, Grand Ballroom (*Dress Optional*). (Ladies may sit in the balcony for program.)

Speakers to be announced later

Headquarters:

Copley-Plaza Hotel

LOUIS A. OLNEY
President Emeritus
Chairman of Research Committee

DUNCAN FERGUSON
Vice-President

WM. R. MOOREHOUSE
Treasurer

CLARENCE L. NUTTING
Chairman, Northern New England Section

Abstracts

of Papers to be Presented at Nineteenth Annual Meeting

Copley-Plaza Hotel, September 15 and 16, Boston, Mass.

Surface Cation Active Compounds in the Textile Industry

JACOB KATZ
Warwick Chemical Co.

WITHIN the last few years a new series of organic derivatives have appeared in the textile industry under the name of "Cation Active Compounds." They are called "cation active" because the interesting (effective) part of the molecular structure is the cation (positively-charged part of the molecule), whereas most of the surface active substances employed in the textile industry today are anionic (negatively charged) in activity. Inasmuch as the cation compounds are diametrically opposed to soaps, sulfated alcohols, etc., in ionic structure, so the chemical and physical reactions are opposed to each other. Many of these organic cation compounds are immune to hard water, acids, bases, and salts. They are compatible with starches, gums, dextrines, etc., and are substantive to cellulosic materials. At present they are being used for:

1. Stripping vat and azoic dyeings.
2. Permanent finishing.
3. Auxiliaries.

Chemically these cationic compounds are organic derivatives of nitrogen bases. The system is based on nitrogen with a valence of three and five. The many compounds may be classified into three main divisions.

1. The acylated nitrogen bases and pyridine compounds.
2. The salts of pyridine, alkyl amines, etc.
3. The quarternary ammonium salts.

Identification of the Newer Textile Fibers

JOHN H. SKINKLE
Asst. Prof. of Textile Chemistry, Department of Chemistry and Dyeing, Lowell Textile Institute

FROM the standpoint of identification, the newer fibers are markedly difficult to identify because some are microscopically like certain of the older fibers, some give chemical reactions like some of the natural fibers, and some give none of the present reactions of the common fibers but require new tests of their own. The newer fibers include glass fibers, condensed amines and acids (Nylon), vinyl resin fibers, casein wool, mixtures of viscose and casein. Whereas the older fibers could be separated into groups by chemical tests but ultimate detection required the microscope, the newer fibers cannot be identified immediately by the microscope but require confirmatory chemical tests. This paper will describe the tests which are required and the microscopical appearances of the new fibers in contrast to the chemical reactions and microscopical appearances of the older fibers.

Tintinoil Process — A New Method for the Tinting and Conditioning of Textile Fibers

EDWARD H. SCHMIDT
Borne Scrymser Co.

THE constantly increasing use of various types of rayon, as is, and in admixture with cotton, wool, cellulose acetate and silk has made imperative some simple means to permit rapid identification of the stocks in the mill.

Heretofore, the only means of tinting the cut rayon stock or other textile fiber was to dye it in a regular dyeing machine. After dyeing, the staple is hydro-extracted and then dried. After drying, the dyed stock is blended with undyed stock in the picker. This dyeing, extracting and drying leaves the fiber in a harsh, wiry condition, greatly impairing its spinning properties.

Further, many cotton mills which have gone over to rayon or other synthetic fibers are not equipped with dyeing machines. Therefore, use of the conventional method of tinting would require a substantial expenditure for equipment.

The Tintinoil Process consists of a mechanical unit which can be attached to any mixing or blending hopper—at no cost to the mill. The unit is set up for one or more colors. The Tintinoils are contained in reservoirs of suitable capacity, each piped to the metering unit. Any color can be had by the turn of a valve. The process is convenient, automatic and economical.

The Tintinoil Process, fully covered by patents, eliminates the necessity for a separate dyeing operation and the subsequent hydro-extracting, drying and blending.

Tintinoil, which contains conditioning agents, is available in all colors, made from certified dyes which are fugitive when applied to all natural and synthetic fibers.

Modern Dyeing of Staple and Spun Viscose Rayon

C. B. Ordway
Technical Dept., American Aniline Products, Inc.

A DISCUSSION of dyeing methods used in the past on cotton and how they have been applied on staple and spun viscose rayons. The physical and dyeing properties encountered in the processing of staple and spun viscose rayons.

Dyestuff manufacturers have realized that viscose rayon in the staple and spun forms is a distinct fiber or fabric and must be so treated, and dyed. Factors involved in the simplification of dyeing methods for these distinct fibers and fabrics covers:—

1—Dyestuffs and chemical costs;

2—Dyeing methods as to labor and time costs;

3—The effect of dyeing method on processed goods in subsequent manufacturing operations or on finished fabrics;

4—The dyeing method's chemical reactions, if any, and how they may affect the materials composing the dyeing equipment;

5—Fastness results obtainable on dyed goods.

The growing importance of the application of Formanil colors to staple and spun viscose rayons is due largely to the simplicity and economy of these directly dyed and formaldehyde aftertreated colors.

On staple and spun viscose rayons, the Formanils offer better wash, light, and perspiration fastness than that obtainable on cotton.

Spun viscose rayon yarns or fabrics containing wool, rabbit hair, acetate, or silk may be dyed in union shades or effect color combinations by this dyeing method without injury to the fibers other than viscose rayon.

Formanil colors meet many of the requirements presented for the obtaining of satisfactory and simplified dyeing of colors on staple and spun viscose rayons for raw stock, warp, yarns, and piece goods.

Semi-Resin Finishes for Cotton Piece Goods

W. W. Trowell
Hercules Powder Co.

SYNTHETIC resins have been used for some time for certain selected applications of textile finishing. Only recently, however, have synthetics been combined with orthodox finishing ingredients to obtain semi-resin finishes.

This development has been accomplished by the introduction of a new type of thermoplastic resin which shows exceptional compatibility with starches, softeners, mineral oil, waxes, gums, gelatin, latex, sulfonated oils, and other materials commonly used in finishing.

The excellent stability of emulsions of these resins, both alone and in combination with the above mentioned ingredients, makes it possible to produce a wide variety of semi-resin finishes showing marked utility in the finishing of cotton piece goods.

A description of the handling of such resins in backfilling and pure finishing, together with attendant advantages and limitations, is presented. Also cited is the fact that these advantages can be obtained without an increase in overall finishing costs.

A Motion Picture Study of Some Dyeing Phenomena

(Kodachrome Motion Picture)

R. H. Kienle and G. L. Royer
The Calco Chemical Company, Inc.

THE paper will be presented as a motion picture taken in color by the Kodachrome process. Practically all of the views have been taken through the microscope and show action taking place in color as would be seen by actual microscopic examination of the phenomena which are shown. The moving picture makes it possible to show to a large group phenomena which previously have been observed by only a few.

Chemical reactions which produce actual dyestuff are carried out under the microscope and one can see the dye being formed from the intermediates.

The dyeing of wool will be shown in such a manner that one can actually see the dyeing of individual fibers. Several types of dyes will be contrasted in their dyeing characteristics.

A similar dyeing procedure carried out under the microscope shows the dyeing of casein wool with the same dyestuffs and demonstrates definite differences from the dyeing of wool.

Both casein wool and natural wool will be shown decomposing in concentrated sulfuric acid and this will indicate certain differences in properties due to the internal structure of the two fibers.

The dyeing of a blend of various fibers with a dye mixture containing dyes which are substantive to only a certain type of fiber will demonstrate the use of such a dye mixture for fiber identification.

These motion picture studies show the dyer what the microscope can reveal about many of the phenomena which are well known to him. It gives an insight into these phenomena which has proved interesting and instructive.

Microscopic Observations of Wool Dyeing

H. E. Millson, G. L. Royer and M. E. Wissemann
Calco Chemical Company, Inc.

THE recent literature shows considerable interest in the dyeing of wool. Much theoretical discussion has been written on the subject. It is not the idea of this paper to enter into this discussion but rather show some observations which have been made while making microscopic examinations on certain wool dyeing problems. In this

study it has been observed how the individual wool hairs react and how they are responsible for many of the phenomena which are seen in the dyehouse.

By the use of cross-sections prepared by the Hardy method, it can be observed how the dyes enter into the hairs. Reactions carried out on the individual fibers under the microscope also reveal interesting structural differences which have their effects upon dyeing.

Fluorescent light will be used as an interesting tool to show differences between the penetration of fluorescent dyes and will be used to explain certain dyeing characteristics of wool.

Cross-sections of many types and sizes of dyed and undyed wool will be shown by Kodachrome color slides. The progress of dyeing wool with several kinds of dye will be shown by cross-sections made at definite time intervals. Commercial dyeings on new stock, dyeings on previously dyed stock, and dyeings made by varying the order of adding the color will demonstrate what happens in the individual wool hairs.

The fact that wool is a mixture of hairs having quite widely different dyeing characteristics will be shown. Tippy dyeing will be illustrated and data will be presented suggesting exposure of the wool to light as one cause of this phenomenon. Microscopic slides in color will demonstrate how dyes react to these exposed and unexposed hairs.

The use of the microscope in the identification of wool and its related fibers will be demonstrated by both characteristic dye reactions and physical forms as shown in colored photomicrographs.

Flexibility and Drape as Measurable Properties of Fabric

L. J. Winn* and E. R. Schwarz**

FOLLOWING a survey of the literature (See American Dyestuff Reporter, March 20, 1939, and *Textile Research,* April, 1939) the initial portion of the experimental program undertaken at the Massachusetts Institute of Technology Textile Research Laboratories under the direction of the A.A.T.C.C. Committee on the Evaluation of Permanent Finishes in Textiles has been concerned with the measurement of flexibility and drape on a series of instruments devised for this purpose and on a series of ten fabrics ranging from a heavy, resin treated, stiff cotton material through tracing cloth, organdie, cotton and rayon fabrics of various weights to a soft, napped pile fabric similar in appearance and handle to an inexpensive velvet.

The instruments employed were the hanging loop technique for determining the bending length of the specimen, the Gurley flexibility tester adapted to use for textiles, the Schiefer flexometer, and the Bellinson drape tester.

As a result of the determinations of bending length, flexural rigidity, bending modulus, flexing force, drape length, chord length and radius of curvature the series of fabrics have been graded in order of their apparent flexibility. Using as a basis the rigidity of the fabric which is essentially a measure of stiffness, the Spearman coefficient of rating has been computed together with its standard deviation for all samples and under various conditions of test. A correlation table indicates excellent agreement as to rating between the bending length, the rigidity and the measurements performed on the drape tester and the Schiefer flexometer. Less perfect correlation exists between the other methods of test and the order of the fabrics as to stiffness indicated by means of the measurements of rigidity.

In general the data shows that rather inexpensive and easily operated apparatus is satisfactory for the measurement of fabrics of the character of those tested and it is hoped later to correlate this information with actual physical and psychological tests.

The nature of the apparatus employed is discussed together with certain of the advantages and disadvantages inherent to the operation of the various machines. Further details of technique on methods which are relatively new in this country at least are outlined and a simple drape test is described.

*Research Assistant, Division of Industrial Cooperation Project for A.A.T.C.C., M.I.T., Cambridge, Massachusetts.
**Professor of Textile Technology, in charge of Textile Division, M.I.T., Cambridge, Massachusetts.

The Present Status of Casein Fiber

E. O. Whittier and S. P. Gould
Division of Dairy Research Laboratories, Bureau of Dairy Industry, U. S. Department of Agriculture

CASEIN fiber was manufactured for the first time on a commercial scale in Italy in 1936. Production in Europe is now at the rate of about 10 million pounds a year. The chief producer is the Snia Viscosa of Milan, Italy, which uses the process of Ferretti.

In the United States, the only patents on casein fiber so far issued are the public service patents of Whittier and Gould. The fiber is not yet being produced commercially in this country, although several rayon firms have done some development work and one large dairy organization is planning to begin production in the near future in Rhode Island. The process to be used there differs from the processes previously mentioned.

In all the processes so far disclosed, casein is dissolved in alkali and the solution extruded through spinnerettes into an acid bath, usually containing formaldehydes. Various modifiers are used in the casein solution and in the precipitating bath and the fibers are usually aftertreated with formaldehyde solutions, salt solutions, and textile oils.

The Ferretti process requires a casein that has been exposed to an acidity of pH 2.9, the Whittier and Gould

process uses any good commercial acid-precipitated casein, and the process to be used in Rhode Island uses a casein especially prepared.

Casein fiber resembles wool both chemically and physically. Its chief faults have been its inferior tensile strength and its tenderness when wet. Both of these faults are being gradually overcome. It is produced as staple fiber and has been woven almost entirely in mixture with wool. More recently, fabrics have appeared in which casein fiber has been woven with viscose rayon and with cotton. Some fiber has been produced from mixed solutions of casein and viscose.

The Dyeing of Nylon
A Preliminary Survey

P. H. Stott

Technical Laboratory, Dyestuffs Division
E. I. du Pont de Nemours & Co., Inc.

THIS paper is intended to summarize experimental work done to date on the dyeing of Nylon to ascertain the most suitable colors evaluated from the standpoint of applicability and certain fastness properties. Much of the data presented will be in the form of lists of dyestuffs identified by name and Colour Index number showing the affinity of these dyestuffs for Nylon and their adaptability for the fiber in various forms. The paper will include discussions on the most suitable dyestuffs found so far for the dyeing of hosiery and yarn based on semi-practical trials and will indicate possibilities of cross-dye effects between Nylon and other textile fibers.

New Concepts in the Chemistry of Wool

Dr. Milton Harris

Director of Research for the Textile Research Associateship at the National Bureau of Standards

SOME new concepts based on the research program of the Textile Foundation at the National Bureau of Standards are presented.

A New Type Water Repellent

George A. Slowinske

E. I. du Pont de Nemours & Co.

A DISCUSSION will be given of a new type of water repellent which combines with textiles to form a water repellent complex. The new agent is a single chemical compound, and is distinct in character from older type products.

Sodium Sulfate Error in Measuring the Acid Content of Carbonizing Baths

H. C. Olsen and W. B. Prescott with Dr. H. C. Chapin

Lowell Textile Institute

IN solutions around 4 per cent sulfuric acid, sodium sulfate additions caused error in specific gravity measurements amounting to 1.28 times the percent of sulfate present. Electrical conductances were affected by sodium sulfate in the opposite direction, but less than one-fifth as much.

Textone—A New Oxidizing Agent for the Treatment of Textiles

A. L. Dubeau, J. D. MacMahon and G. P. Vincent

Mathieson Alkali Works

TEXTONE is an oxidizing agent containing upwards of 80 per cent sodium chlorite ($NaClO_2$). Although its oxidizing value when calculated as available chlorine is approximately 130 per cent, unlike hypochlorite (Chemic) it does not liberate chlorine when acidified but chlorine dioxide (ClO_2). For this reason it can be used on the acid side without degrading cellulose or cellulose derivatives such as cellulose acetate even at the boiling point of water.

By using Textone in conjunction with a synthetic detergent which is not affected on the acid side the scouring and bleaching action can be carried on simultaneously. This procedure has been used to advantage in the preparation of spun rayon fabric and those containing pigmented rayon filaments. The procedure promotes more even dyeing in a fast, safe, and economical way.

Advantage is also take of the slow oxidizing action of Textone on the alkaline side to incorporate it in kiering solutions where it materially aids the kiering operation by desizing the load and promoting a more even circulation through the load. This practice permits a substitution in whole or in part of the usual treatments preceding the kiering operation. Although Textone does no bleaching under the conditions of high alkalinity existing in a kiering solution there is much evidence to support the claim that the presence of Textone in the kier aids the chemicing operation.

CALENDAR OF COMING EVENTS

Annual Meeting and Convention, Copley-Plaza Hotel, Boston, Mass., September 15 and 16, 1939.

* * *

Fall Outing, Philadelphia Section, Torresdale Country Club, September 22, 1939.

* * *

Annual Meeting. Piedmont Section, Hotel Charlotte, Charlotte, N. C., October 7, 1939.

Report of the
Research Committee
1939

LOUIS A. OLNEY*

IT is well recognized that quarter century intervals or multiples thereof represent the most appropriate periods for presenting reviews of the activities of any organization. This naturally would be true of the American Association of Textile Chemists and Colorists, but the eighteen year period of activity of our Research Committee has been sufficiently noteworthy, we believe, to warrant such a review, even though it covers a shorter period of time.

An adequate presentation of the work of our Research Committee should go further than a mere *REVIEW OF PAST ACCOMPLISHMENTS*. It should discuss our *MORE RECENT ACTIVITIES*, and a *PROGRAM FOR THE FUTURE*. As a matter of convenience we have divided this report under these three headings.

RECORD OF THE PAST

In a general way one might refer the reader to the list of publications of the Research Committee given at the conclusion of this report and then dismiss the subject. It presents, at least in outline, a survey of the activities of our Research Committee since its inception eighteen years ago. This list consists of ninety five individual papers and reports of the Research Committee all of which have been published in the Proceedings of the Association. Foremost in number, among these, are papers which have been presented by our Research Associates upon original research projects and investigations, followed by reports of sub-committees on standardization and standard methods, and finally, a number of reviews and bibliographies upon subjects of importance to textile chemists and colorists.

During the first period covering approximately seven years the Research Committee concentrated its efforts chiefly upon the establishment of fastness standards for dyed textile materials; developing laboratory methods for class identification; and the selection of certain dyes, which, when properly applied, would give dyeings, typical of each of the recognized classes.

Fastness standards and test methods were thus established for fastness to washing or laundering, fulling, bleaching and stoving of dyed cotton, rayon, wool and silk fabrics; also, fastness to light, crocking or rubbing, perspiration, acids, alkalies, carbonization and sea water.

Standard sets of dyeings have been prepared representing the different degrees of fastness to washing and laundering of dyed cotton, wool and silk; fastness to light, and fastness to crocking or rubbing. These are available at a nominal price through the Association.*

Financial support during this period was furnished entirely by returns from our Corporate Memberships and several generous contributions from the National Association of Wool Manufacturers.

MORE RECENT ACTIVITIES

Naturally, it is difficult to draw any sharp dividing line between the first and second periods previously indicated, but it is closely associated with the advent of financial assistance from the Textile Foundation.

Beginning in 1930 with an allocation of $5,000.00 from the Textile Foundation additional research associates were engaged to work on projects involving fundamental and applied research. From that time through 1938 the Textile Foundation appropriated varying amounts each year, the maximum being $14,000 in 1937. During 1935 and 1936 the Chemical Foundation contributed more than $5,000.00 towards our research work and the Eavenson & Levering Company contributed $2,400.00 during 1935 and repeated this contribution in 1936. By far the largest portion of these grants was used in the support of the work carried on at the Bureau of Standards by a group of chemists under the direction of Dr. Milton Harris and supervised by our committee on the Chemistry of Wool, of which Alban Eavenson was its efficient chairman for several years.

Other research projects carried out during this period were the Fundamental Study of Vat Printing Pastes, upon which Dr. Sivert N. Glarum and Dr. Leland F. Gleysteen worked at Brown University, under the guidance of a special committee of which Mr. William H. Cady was chairman.

A series of research projects was carried out by Mr. Ryberg at the Lowell Textile Institute, under the supervision of what is now known as our committee on the Chemical Technology of Wool Fiber, of which Hugh Christison is chairman. The subjects worked upon by Mr. Ryberg were as follows:

*Chairman, Research Committee.

*Information regarding these standard sets of dyeings may be obtained by writing to Louis A. Olney, Lowell Textile Institute, Lowell, Massachusetts.

The Establishment of a Standard Laboratory Method for Determining the Fastness of Dyed Textile Materials to Fulling.

A Study of the Carbonizing Process.

Methods of Determining Oil, Soap and Other Extraneous Matter in Textile Materials.

Determination of Causes of Damage of Dyed Wool. (The latter project is still being studied.)

The Committee on the Analysis of Fiber Mixtures under the chairmanship of Alex. Morrison supervised Mr. Ryberg's project on working out the Standard Sulfuric Acid Method for Determining the Percentage of Wool in Fiber Mixtures.

During 1935 and 1936 a total of $5,000.00 was contributed by the Textile Foundation especially appropriated towards the support of a cooperative research project, worked upon jointly by the A.A.T.C.C. and the Throwsters Research Institute. Industry contributed an equal amount towards this project. It was supervised by a joint committee of which Berkeley L. Hathorne is Chairman and the active work done by W. F. Macia. This project which covers a very complete study of the subject of Rayon Creping is not wholly completed as yet, but during the past year an extended report covering most of this work has been published in the Association's Proceedings and more is to be published later.

A research project extending over several years upon a Study of the Various Phases of Mercerization was carried out at the University of Chattanooga by Sidney M. Edelstein and several assistants under the guidance of a committee with Charles B. Ordway and Harold Schroeder acting as chairmen at different times. This project was supported entirely by Association funds.

At the present time a research project is being carried out on the subject of "Crease-resistance and Permanency of Finish and Fabrics" under the direction of a committee of which Kenneth H. Barnard is chairman. The experimental work is being conducted at the Massachusetts Institute of Technology under the supervision of Professor Edward R. Schwarz and several assistants. This work is also being financed wholly by funds of the Association.

FUTURE PLANS

During the past year we have entered the third stage of development indicated at the beginning of this report. Briefly we can say that it will be characterized by the following activities:

First—Critical review and study of all standards and methods of testing thus far adopted particularly with the object in mind of coordinating them, where it may be possible, with the requirements of textile manufacturers, dyestuff distributors, textile sales agencies, and ultimate consumers.

Our methods which are the outcome of long periods of investigation and experimentation, have been formulated by experienced minds, and therefore are based upon technical data and scientific truths; consequently they may not in each and every case satisfy all concerned. However, where any question arises an honest effort will be made, on the one hand, to convince any dissenters, yet on the other, to accept their views if they appear to be logical and to the advantage of all concerned. In this connection we shall continue our endeavor to develop International Standards.

Second—Continuation of a program of Applied Research, keeping in mind, at all times, projects which may prove to be of value to the textile and dyestuff industries. Furthermore, an endeavor will be made to translate into terms of application for the benefit of these industries, the more fundamental facts and theories, which may be discovered and formulated by the group of chemists supported by the Textile Foundation and now working at the Bureau of Standards under the leadership of Dr. Milton Harris.

Third—The development of an increased spirit of cooperation with existing scientific, technical, textile and trade organizations endeavoring to assist them through consultation and advice, wherever it may appear that we are qualified to do so. Recently the association has taken out membership in the American Standards Association, which we believe will prove a satisfactory step in this direction.

Furthermore, we shall endeavor to protect Textile Manufacturers as well as dyestuff distributors against the adoption of standards and methods of testing which may work to their disadvantage, such having been based on false premises, or advocated for the special benefit of some particular group.

FINANCIAL SUPPORT

It is hoped that the program outlined above will appeal to textile and allied interests, sufficiently to warrant their cooperation and support.

As previously stated, the Textile Foundation has modified its policy, and from now on the A.A.T.C.C. will not be the recipient of this financial support, which has been so generously allocated in the past. It appears that the Directors of the Foundation have definitely adopted the policy of supporting only Fundamental Research, and that largely upon the premise and belief that the Textile and Allied Industries should support applied research; the development of standards and test methods; and, the type of work in general which has been carried on by our Research Committee. As a result we must appeal to industry for the funds necessary to continue our work. Up to now we have made no organized effort to secure Corporation Memberships, and we hesitate even now about doing so, but from now on these must constitute our main support. We therefore hope that there will be an immediate and generous voluntary response to our appeal. An

increase in our list of sustaining memberships would also constitute a valuable means of support. We believe there are many individual members sufficiently interested in our work to come to our assistance at this time.

In closing this report, appreciation should be expressed and full credit extended to those who have given so generosly of their time and energy in the support of our work. There are so many, that it is out of the question to mention them individually, but it is hoped that they have enjoyed their work and found it profitable in one way or another.

During 1938 and so far in 1939 Research Committee meetings have been held as follows:

One Hundred and Ninth—Providence Engineering Society Building, Providence, R. I., February 11, 1938. Am. Dyestuff Reptr. *27*, 246 (1938).

One Hundred and Tenth—National Bureau of Standards, Washington, D. C., April 30, 1938. Am. Dyestuff Reptr. *27*, 306 (1938).

One Hundred and Eleventh—Chemists' Club, New York, N. Y., June 1, 1938. Am. Dyestuff Reptr. *27*, 418 (1938).

One Hundred and Twelfth—Engineers' Club, Boston, Mass., October 21, 1938. Am Dyestuff Reptr. *27*, 746 (1938).

One Hundred and Thirteenth—Atlanta Biltmore Hotel, Atlanta, Georgia, December 2, 1938. Am. Dyestuff Reptr. *28*, 97 (1939).

One Hundred and Fourteenth—Chemists' Club, New York, N. Y., February 11, 1939. Am. Dyestuff Reptr. *28*, 201 (1939).

One Hundred and Fifteenth—Penn Athletic Club, Philadelphia, Pa., April 21, 1939. Am. Dyestuff Reptr. *28*, 265 (1939).

One Hundred and Sixteenth—Chemists' Club, New York, N. Y., June 16, 1939. Am. Dyestuff Reptr. *28*, 428 (1939).

Publications of Research Committee

Publications of the Research Committee to date, all of which appear in the Proceedings are as follows:

"A Summary of the Progress Made to date (1922) by Various Investigators in an Effort to Standardize Methods for Determining the Fastness of Dyes to Light." W. H. Cady, Nov. 20, 1922, pages 92-4.

Report of Series 1 Light Exposures. A comparison of various types of artificial light with sunlight. Light Committee, Jan. 14, 1923, pages 6-7.

Report of Series 2 Light Exposures. A comparison of sunlight, the violet carbon arc, and the mercury vapor arc (with glass shield). Year Book, 1924, page 73.

Observations on Sunlight Exposures. Light Committee, Dec. 28, 1925, pages 225-6.

"Effect of Alkalies on Wool. Importance of Hydrogen Ion Concentration." Harold C. Chapin, Dec. 28, 1925, page 231.

"Quantitative Studies, Action of Alkalies (Caustic Soda) on Rayon Silks." Arthur K. Johnson, Dec. 28, 1925, page 238.

"Studies on the Relative Hygroscopic Properties of Rayon Silks." Arthur K. Johnson, Dec. 28, 1925, page 238.

"Experiments with the Mazda Incandescent Lamp for Laboratory Fading Tests." W. D. Appel, Dec. 28, 1925, pages 246-7.

"Reaction of Potassium and Sodium Compounds on Wool." Harold C. Chapin, Feb. 7, 1927, page 41.

Report of Series 3 Light Exposures. This comprises 22 sunlight exposures, 6 exposures to the violet carbon arc (Fade-Ometer), and 9 to the Mazda Incandescent lamp. Light Committee, Nov. 14, 1927, pages 179-187.

"Experiments with the Photo-electric Cell in Relation to Testing the Fastness to Light of Dyed Materials. W. D. Appel, Nov. 14, 1927, pages 187-191.

Report of Series 5 Light Exposures. "The Fading of Dyed Textiles in the Light transmitted by Various Glasses." W. D. Appel and W. C. Smith, June 25, 1928, pages 180-192.

Report of Series 4 Light Exposures. 1,252 dyed samples were exposed to sunlight in several different ways, and to the violet carbon arc. Light Committee, June 24, 1929, pages 217-256.

Report of the Sub-Committee on Standard Methods of Determining Sizing, Weighting and Finishing Materials in Textiles, October 26, 1931.

Report of the Sub-Committee on Rayon dealing with Methods of Identification and Recognition of the Different Rayons, October 12, 1931.

"Fade-Ometer Tests with a Corex-D Globe." W. H. Cady and W. C. Smith, Nov. 23, 1931, pages 326-8.

"The Effect of pH on the Photo Chemical Decompostiion of Silk." Milton Harris in cooperation with Daniel A. Jessup of the Bureau of Standards, December 7, 1931.

"The Physical Chemistry of the Proteins of Silk and Wool." Milton Harris, Feb. 1, 1932, pages 58, 62, 76, 96*.

"Report on the Spectral Reflection of Eleven Samples of Dyed Cloth" prepared by the Colorimetry Section of the Bureau of Standards at the request of the sub-committee on Fastness to Washing of Dyed Silk. Feb. 29, 1932, pages 121-124.

"The Iso-electric Point of Wool." Milton Harris, June 20, 1932, pages 233-237*.

"Tensile Strength and Elongation of Rayon." Rayon Sub-Commtitee, Feb. 12, 1932, pages 266-7.

"The Iso-electric Point of Silk." Milton Harris, Oct. 10, 1942, pages 278-9*.

"The Development of a Laboratory Method for Testing the Fastness to Fulling of Dyed Wool." Bertil A. Ryberg, Nov. 21, 1932, pages 302-6, 315*.

"The Determination of Moisture in Sulfonated Oils." Ralph Hart, Chairman Sub-Committee on Sulfonated Oils, pages 307-315, Nov. 21, 1932.

"The Application of the Results of the Study of the Iso-electric Point of Wool to Some Practical Problems. Milton Harris, Jan. 30, 1933, pages 55, 56 and 57*.

"An Accelerated Ageing Test for Waterproofed Ducks and Similar Fabrics." Wm. C. Smith, Feb. 13, 1933, pages 78-82.

"The Combination of Silk and Wool with Positive and Negative Ions." Milton Harris, April 24, 1933, pages 177, 178, 188*.

"Fastness to Washing of Dyed Wool." Bertil A. Ryberg, April 24, 1933, pages 179-181.

"The Determination of Organically Combined Sulfuric Anhydride in Sulfonated Oils." Ralph Hart, Chairman Sub-Committee on Sulfonated Oils, Nov. 20, 1933, pages 357-366.

"A Fundamental Study of Printing Pastes." Sivert N. Glarum, March 26, 1934, pages 85-89*.

"The Carbonizing Process." Milton Harris, April 23, 1934, pages 106-111*.

*Report of work done under a grant from Textile Foundation.

"A Study of the Carbonizing Process." Bertil A. Ryberg, April 23, 1934, pages 112-121*.

"Review of Carbonizing Project." Roland E. Derby, Chairman Sub-Committee on Carbonizing, April 23, 1934, pages 123-126.

"Determination of Inorganic Salts in Sulfonated Oils." Ralph Hart, Chairman Sub-Committee on Sulfonated Oils, May 21, 1934, pages 150-159.

"The Iodine Number of Wool: A Method for Determining the Action of Various Chemical Reagents on Wool and Other Proteins." Milton Harris, Harvey Neville and Wm. C. Fritz, June 4, 1934, pages 171-174.

"The Photochemical Decomposition of Silk." Milton Harris, July 16, 1934, pages 215-217*.

"Rayon Identification" (Revised Method), August 13, 1934, pages 241-246.

"Quick Tests for Certain Properties and Causes of Faults in Rayon Yarns and Fabrics." Rayon Sub-Committee, September 19, 1934, pages 262-264.

"A Comparison of the Fading Produced by Four Fading Lamps and the Sun on Forty Selected Dyeings." Light Committee, Nov. 5, 1934, pages 283-4.

"Fading of Dyeings in Radiation of Different Intensities." W. D. Appel, June 3, 1935, pages 194-9.

"Effect of Alkalies on Wool." Milton Harris, October 7, 1935, pages 306-311*.

"Commercial Grading of Sulfonated (Sulfated) Oils." Sulfonated Oil Committee. March 9, 1936, pages 122-125.

"A Fundamental Study of Vat Printing Pastes." Sivert N. Glarum, March 23, 1936, pages 150-157*.

"The Oxidation of Wool; The Effect of Hydrogen Peroxide." Arthur Smith and Milton Harris, April 6, 1936, pages 180-182*.

"The Oxidation of Wool; The Lead Acetate Test for Hydrogen Peroxide-Bleached Wool." Arthur Smith and Milton Harris, April 6, 1936, pages 183-185*.

"A Test for Mercerization in the Presence of Dyes." Sidney M. Edelstein, April 6, 1936, pages 186-190.

"The Mechanism of Sulfur Lability in the Alkali Degradation of Wool Protein." J. A. Crowder and Milton Harris, May 18, 1936, pages 264-266*.

"The Determination of Wool in Wool-Cotton Textile Materials." Bertil A. Ryberg, June 1, 1936, pages 296-302*.

"The Oxidation of Wool; Photochemical Oxidation." Arthur Smith and Milton Harris, July 13, 1936, pages 383-385*.

"A Study of the Mercerization Process." Sidney M. Edelstein, August 24, 1936, pages 458-466.

"The Oxidation of Wool; Alkali Solubility Test for Determining the Extent of Oxidation." Milton Harris and Arthur Smith, October 5, 1936, pages 542-545*.

"The Determination of Wool and Mohair by Scale Size and Diameter." John H. Skinkle, November 16, 1936, pages 620-621.

"The Determination of Alkalinities and Acidities in Sulfonated (Sulfated) Oils, Committee Report No. 6. Ralph Hart, December 14, 1936, pages 696-707.

"A Study of the Mercerization Process. Part II. The Effect of Tension." Sidney M. Edelstein, December 28, 1936, pages 724-726.

"Methods for the Study and Control of Mercerization." Sidney M. Edelstein, January 25, 1937, pages 40-44.

"The Measurable Properties of Vat Printing Pastes and Thickeners." Sivert N. Glarum, March 8, 1937, pages 124-126*.

"The Reaction of Wool with Strong Solutions of Sulfuric Acid." Milton Harris, Ralph Mease and Henry Rutherford, March 22, 1937, pages 150-153*.

"Some Causes of Rayon Crepe Variations with Special Reference to Throwing." W. F. Macia, June 14, 1937, pages 329-333*.

"State of the Sulfur in Oxidized Wool." Milton Harris and Arthur Smith, July 26, 1937, pages 413-415*.

"Nature of the Acid-Dyeing Process." Milton Harris and Arthur Smith, July 26, 1937, pages 416-419*.

"A Study of the Mercerization Process. III. The Effect of Caustic Temperature and Impurities in the Caustic." Sidney M. Edelstein, July 26, 1937, pages 423-427.

"Variations in the Removal of Pectic Substances from Cotton Yarn in the Mercerization Process as a Source of Dye Affinity Variation in Mercerized Yarn. Sidney M. Edelstein, July 26, 1937, pages 427-432.

"Luster Determination with a Photoelectric Photometer." Henry Ransom and Sidney M. Edelstein, July 26, 1937, pages 432-437.

"A Fundamental Study of Vat Printing Pastes. II. A Study of the Influence of the Methods of Preparation of Printing Thickeners on the Thickening Value and 'Color Yield.'" Sivert N. Glarum, July 26, 1937, pages 437-445.

"A Bibliography of Mercerization." Sidney M. Edelstein and Wm. H. Cady, July 26, 1937, pages 447-460.

"The Effect of Aniline Black on Barium Activity Determinations." Sidney M. Edelstein, July 26, 1937, page 460.

"Methods of Determining Oil, Soap and Other Extraneous Matter in Textile Materials. I. Investigation of the Nature of the Material Obtained by the Extraction of Wool with Ethyl Alcohol." Bertil A. Ryberg, July 26, 1937, pages 461-467*.

"The Determination of Unsaponifiable Non-Volatile Matter in Sulfonated (Sulfated) Oils." Report No. 7. Ralph Hart, October 18, 1937, pages 634-638.

"The Estimation of Amino Nitrogen in Insoluble Proteins." Henry A. Rutherford, Milton Harris and Arthur L. Smith, November 1, 1937, pages 650-655*.

"Textile Color Terms, Specifications and Problems." W. D. Appel, November 1, 1937, pages 655-658.

"Stress-Strain Characteristics of Wool as Related to Its Chemical Constitution." Arnold Sookne and Milton Harris, November 1, 1937, pages 659-666*.

"Evaluation of Crush Resistant Finishing Treatments for Fabrics." Herbert F. Schiefer, November 1, 1937, pages 667-669.

"Report of the Rayon Crepe Research." November 1, 1937, pages 670-687*.

"What Can the Mill Man Expect from Fundamental Research?" Milton Harris, January 10, 1938, pages 6-8.

"Methods of Determining Oil, Soap and Other Extraneous Matter in Textile Materials. II—Investigation of the Nature of the Material Obtained by the Extraction of Wool with Ethyl Alcohol." Bertil A. Ryberg, January 10, 1938, pages 8-13*.

"A Note on Vat Printing Pastes." Leland F. Gleysteen, January 10, 1938, pages 14-15*.

"The Use of Standard Dyeings in Tests for Color-Fastness to Light." W. D. Appel, January 10, 1938, pages 15-16.

"Report of the Rayon Crepe Research." January 10, 1938, pages 17-22*.

"The Reaction of Wool with Hydrogen Peroxide." Henry A. Rutherford and Milton Harris, April 4, 1938, pages 173-174*.

"Photochemical Reaction of Wool." Milton Harris and Arthur L. Smith, April 4, 1938, pages 175-178*.

"The Detection of Oxidation in Wool." Henry A. Rutherford and Milton Harris, April 4, 1938, pages 179-180*.

"Methods of Determining Oil, Soap and Other Extraneous Matter in Textile Materials. III—Investigation of the Nature of the Material Obtained by the Extraction of Commercially Clean Wool with Ethyl Ether." Bertil A. Ryberg, April 4, 1938, pages 180-183*.

"Bibliography on the Chemistry of Wool." Arthur L. Smith and Milton Harris, April 4, 1938, pages 183-198.

"A Fundamental Study of Vat Printing Pastes." Sivert N. Glarum, May 30, 1938, pages 303-305*.

"Bibliography on the Chemistry of Wool." Arthur L. Smith and Milton Harris, July 11, 1938, pages 363-392.

"A Measuring Stick for Textile Printing Pastes." William H. Cady, October 17, 1938, pages 569-571.

*Report of work done under a grant from Textile Foundation.

"Bibliography on Methods for Determining the Causes of Damage Appearing in Wool After Dyeing." B. A. Ryberg, October 17, 1938, pages 571-602*.

"Technical Evaluation of Finishing Treatments." E. R. Schwarz, March 20, 1939, pages 138-146.

"Report of the Rayon Crepe Research VI. The Determination of Some of the Variations in Normal First Quality Viscose Rayon." April 3, 1939, pages 163-192*.

"Report of the Rayon Crepe Research V. The Determination of the Effects of Variations in the Manufacture of Rayon Crepe Dress Fabrics." May 1, 1939, pages 226-254*.

"A Fundamental Study of Vat Printing Pastes." Leland F. Gleysteen, May 29, 1939, pages 280-284*.

"Report of the Rayon Crepe Research VII. The Effects of Some Variations in Dyeing and Finishing upon the Pebble of Rayon Crepe Fabrics."* May 29, 1939, pages 289-292*.

"The Base-Combining Capacity of Wool." Milton Harris and Henry A. Rutherford, May 29, 1939, pages 293-297*.

"Group C—Fastness Tests for Dyed or Printed Cotton." Complete revision. June 12, 1939, pages 312-314.

"The Evaluation of Finishing Treatments." August 7, 1939, pages 417-418.

"A Consideration of the A.A.T.C.C. Official and the Canvas Disc Methods for the Evaluation of Wetting Agents." Carl Z. Draves, August 7, 1939, pages 421-424.

"Evaluation of Wetting Agents—Official Method." Carl Z. Draves, August 7, 1939, pages 425-428.

*Report of work done under a grant from Textile Foundation.

Report of the Committee on

Crease Resistance and Permanent Finishes

K. H. BARNARD*

THIS year marks the initial use of a modest appropriation from the Association's research funds to actively pursue better methods for evaluating textile finishes. Through a cooperative agreement with M.I.T., Prof. E. R. Schwarz is directing this investigation with two part-time associates working on it. They now have two successful methods, both of which require a minimum of equipment:— merely a loop of cloth, a slide rule and an inexpensive cathetometer. The beauty of these methods lies in the extent of the results obtained so simply, through the insight of a trained physicist.

The first method, the hanging loop method, was originally developed by the British. The deformation of the loop is measured with a cathetometer and from this three different values may be obtained: Thus:—

First: *The Bending Length*—that is, the unit length of cloth which will give a unit angle of deformation if the cloth is held horizontally at one end and the other allowed to bend downward through its own weight. This is a function of the cloth's stiffness and the hanging loop method gives the same bending length results as obtained by other methods but does it better.

Second: *The Modulus of Flexural Rigidity*, which is a measure of the internal coherence of the fabric. This is a function of the unit weight times the cube of the bending length.

Third: *The Modulus of Bending*—this indicating the differences to be expected of the same cloth in different thicknesses or in colloquial language, its paperiness. It is expressed as 12 times the Modulus of Rigidity divided by the cube of the thickness.

The second method utilizes the drape meter, invented by Prof. Schwarz. Here the cloth is held by one edge only and bent around a vertical axis, whereas in the hanging loop the bending axis is horizontal and two edges are held. While the simplicity of both methods cannot be overemphasized, at the same time reproducible results are obtained which show a thousand-fold difference between soft and stiff cloths and yet the method is so delicate it will show whether the cloth is bent with the face out or in.

In these methods the amount of deformation is being measured under no added load other than the cloth itself, whereas in most other methods such as Schiefer's flexometer and the Gurley stiffness tester the amount of force required to produce a certain deformation is measured. There should be some close relationship between these two ways of getting results and this will be found through the Spearman rating system, which is merely a mathematical way of rating a series of samples by two or more different methods of test. Professor Schwarz expects to give a paper at our annual meeting this September in which he will compare the results obtained by his methods with those obtained on the Gurley and Schiefer instruments on the same series of samples.

Thus from all this work it seems as if the objectives of this committee, namely finding simple methods for accurately evaluating finishes are well within reach of attainment and the next step will be the publication of the details of these methods and the results obtained with them.

*Chairman.

Recent Developments of

Resins for Textile Application*

DR. D. H. POWERS**

I BELIEVE it has been two years since I have spoken before this Section and I want to add that I always enjoy speaking here because of your stimulating and pertinent questions.

Before going into the field of resin developments of the past few years, I want to remind you again of what I said two years ago, namely, that resins are of particular importance because they are a new *building tool,* a new medium or material out of which we can make our fibers, fabrics, houses, airplanes, automobiles, jewelry and even statuary. As a typical instance, the farmers of Southern New Jersey used to sell their tree stumps at a good premium, since they were used to make saw handles. Today, they are making those handles in ten seconds from a tough resin by a single stroke on a molding press. Instead of carving out steering wheels, they mold them from resins. Instead of carving ornate furniture and table legs, they can mold them out of resin.

USING OLD RESINS FOR NEW USES

In reviewing the past few years of resin developments a most significant point seems to be, not the synthesis of new resins, but rather the application of old resins for new uses. It isn't a question of needing new types of resins, but rather of putting to work and taking advantage of the wide variety that is already available. In a great many fields they are turning to resins as new material for building. Although resins are still getting a lot of unfortunate ballyhoo in the Sunday supplements, they are really getting down to work and becoming less spectacular and more practical.

Resins are also going to work in the textile field and I hope to cover briefly some of the results obtained. Here again, it is not because new resins are available, but because they are studying the effect of resins as a means of modifying and improving textiles. We are hearing of resin fibers, all resin fabrics, resin coated fibers and resin impregnated fibers and fabrics. In the last few years there has been tremendous progress in the modification of textile fabrics with small amounts of resins so that the resulting fabrics look and feel like ordinary fabrics, although they may be much stronger, much more resilient or much more resistant to slippage or shrinkage. Whether the next few years will see the greatest development in all resin fabrics or resin modified natural fibers depends on how actively we put these resins—these new building tools—to work to help us with our problems.

RESIN STATUES FOR THE WORLD'S FAIR

A striking development in the resin field, which is far removed from textiles, has been the translucent statues at the New York World's Fair: these statues are nine and one-half feet high and weigh approximately 1500 pounds. As little as two years ago they would have said it was impossible to produce those statues from resin. In front of the government building at the Fair, they decided they would have twelve statues, larger than life size—illuminated from the inside. The idea was that they would produce them out of glass, and they estimated they would weigh some three tons each and that they would cost $68,000 apiece.

A very able and very ingenious sculptor in New York decided to investigate the possibility of using resin for this purpose. He made a plaster cast of the statue, but found that if he made the ordinary mold it would be impossible to use it because it would be so huge he wouldn't be able to handle it, and wouldn't have a press big enough. So he developed a simple means of taking a plaster cast of the statue and coating it in rubber Latex. He obtained a flexible rubber mold exactly reproducing the statue. This thin sheet of rubber he could peel from the plaster mold and fill with resin. He put it in an oven at a reasonably low temperature for about ten days and when he peeled off his rubber mold at the end of two weeks, he had a solid piece of clear resin, which was exactly according to his plaster model, following all the fine details and line, and having some undercuts which could not be obtained with the old types of molds. He didn't use new resin. The resin he used was developed in 1908. He put an old resin to work for a new specific problem where the existing materials were either too expensive or not satisfactory.

The automobile and airplane industry today are probably the biggest use of clear resins. In the airplane industry the resins do something that the other materials don't do. When they started to build high speed planes, they had a glass front and they found that if they could make them perfectly streamlined—in other words, like a waterdrop—and have less frictional resistance, they could bring up the speed of the planes appreciably. Obviously, when you go 400 miles an hour, it makes a real difference whether there is perfect streamlining or not. As a result, they developed and have used ever since, streamlined cockpit enclosures made out of clear resin which can be shaped. In addition to that, they save about fifty pounds in weight on each plane. The resins are again doing things that haven't been possible before.

*Presented before New York Section, March 24, 1939.

**Röhm & Haas Company, Philadelphia, Pa.

USE OF CLEAR ACRYLATE RESINS

An interesting resin development is the recent use of the *clear* resins. One of the reasons that clear resins haven't developed sooner is that they are more expensive than the dark colored or opaque resins. You can dilute opaque resins with as much as 90 per cent of inert filler, such as asbestos, wood flour or clay, and consequently these diluted resins have a much wider application where cost is an important factor. However, recent development of clear resin and colorless resins has opened up new fields where it has not been possible to use glass.

This resin happens to be one of the *acrylate* type and you notice it is an excellent conductor of light. If you pass a beam of light through this tube the light goes around the bend. In fact, it has been suggested that we light our houses of tomorrow by putting a single light bulb in the cellar and have a tube of resin running from the cellar to each room, and then we could light the whole house with one bulb.

In reviewing the resins that have become more important during the past few years, there has been a great deal of publicity given these acrylate resins because of their clarity. They aren't new and we ourselves have been actively working on them for ten years. Although we first studied them over thirty years ago, we are still working out new applications for them.

The reason they are being used in the airplane industry is not because they are stronger or clearer but because they are lighter and can be streamlined. For dental instruments, there is a wide use for these clear resins as a means of carrying light around a corner into the patient's mouth.

A designer here in New York has made a piano out of one of these clear resins, and has also made a very convenient desk. All of the drawers of the desk are made out of the clear resin so you don't have to open the drawer to see what is in it. I am afraid most of us would rather have opaque desks.

OTHER RESIN TYPES

The styrol or *styrene* resins have recently received a good deal of publicity. They have been in the laboratory as an experimental product for the last fifteen years. However, their recent commercial development and application has made it seem very likely that they will soon be one of our more important resins.

The *phenolics* are being developed further and modified *polyvinyl acetals* seem to be unusually promising where tough adhesive films are necessary.

The *nitrogen* containing resins are slowly developing, although they are harder to control and much harder to handle. Nylon is a resin of the nitrogen type and you have heard a great deal about its application and future. You realize that, here too, there is still a great deal of development work to be done in working out the kinks.

DEVELOPMENT OF RESINS FOR TEXTILES

In turning to the developments of resins in the textile field, it is particularly true that resins are just beginning to be worked out. Resins in the textile field are beginning to have less—shall we say less publicity and more actuality? Today, it is possible by the selection of a proper resin to build into a fabric almost any property. The interesting thing about that is that resins, because they are building materials, because they can be applied in a soluble form and converted into an insoluble form, they can be applied either *in* the fiber, or *on* the fiber, or *between* the fibers, or in the yarn, or on the surface of the yarn, and as a result of that ability of resins to be built in the place where we want them, they are becoming an important adjunct in the treatment of textile fabrics.

THE ANTI-CREASE PROCESS

There is no question that one of the earliest of the fabric treatments, other than coatings, is the anti-crease finish developed by Tootal, Broadhurst, Lee of Manchester, England. I think I am right when I say that during the past two years the anti-crease process has tended to become slightly less important rather than more important, and I think that is not because the anti-crease process is not an effective process for improving fiber resilience, but because for some reason or other in this country you have to promote, you have to advertise, you have to actively push a development of this type. It is clearly evident that anti-crease is a development that still has tremendous possibilities, but it is still waiting for a concerted promotion.

All of you have seen certain cotton or rayon fabrics with the anti-crease resin polymerized within the fiber and you will have to concede that it gives a tremendous improvement to those fibers, so much so as to take them entirely out of their class. There has been some work done by testing laboratories that indicates that resin treated rayons and spun rayons have more resilience, more durability than a fabric of identical construction made entirely of wool.

There is no question that the rayon processors have a tool, in the production of crush resistant fabrics, for really developing fabrics which would cause the wool industry some worry, even with their quality fabrics. But it should not be used as a tool merely to build up a low grade fabric and sell it in place of a more expensive one.

METHODS OF APPLICATION

At first only the *urea formaldehyde* type resins were used, and they required a high temperature to convert them from their soluble to their insoluble state. In this connection, there has been a great deal of improvement in textile curing equipment. You are all acquainted with the new high temperature frames, which have temperatures of as high as 350° C. That doesn't mean the goods themselves reach this temperature, but it does mean that you can approach temperatures over 250° F. The modern

type of loop driers generally feed in steam at temperatures of over 300° F. There again, the drier may be that temperature, but the fabrics will be very much cooler. More recently still, the flash dryer has been developed which is a process of running the goods for a fraction of a minute through a temperature of 400° or 500°F. Equipment of this sort is becoming available and being installed in mills, so that curing temperatures well over the usual 200° F. are more generally available.

Today more resins are available which do not require heat to cure and set them. One type is the urea formaldehyde resins already polymerized, already water insoluble, and which do not require further curing. Another type of resins which are water insoluble at the time of their application are the acrylates and they are becoming of increasing importance since they are clear, absolutely colorless, absolutely water-white and require no further heat or curing to apply them.

The RHoplex types have the unique advantage of being available in emulsion without the presence of any organic solvent, and by varying the resin from an extremely soft form to an extremely hard form, it is possible to get all the way from a very soft effect to a very stiff or organdy effect. You do not get the penetration of the fiber that you get with the RHonite type because your resins are already polymerized. However, it is interesting to note that even with the surface type resins resilience may be imparted due to the flexible nature of the film.

USE OF CATION ACTIVE SOAPS

One of the more important articles that has appeared abroad is the paper by Blow who was working for the Wool Industries Research Association in England, and who had been studying the conditions for depositing rubber latex on wool. He pointed out there that the main trouble in the treatment of wool with rubber is that it usually made it feel like a piece of rubber. He made a careful study of the different types of agents and found that the cation active soaps, the so-called quaternary ammonium compounds, were particularly useful on wool, cotton or rayon fibers. It was shown in his work that if he treated wool with a tenth of one per cent of a cation active compound and then passed it through a 5 per cent water dispersion of Latex, instead of having three-tenths of one per cent of the rubber retained after a wash, he had twelve per cent. He also had a fabric which still felt like a woolen or worsted. He found that a pre-treatment of his fabrics with a cation active compound greatly increased their affinity for latex.

He has also shown that latex may be treated with a cation active soap to change the charge on the particle. He finds that by this pre-treatment with these cation active compounds he develops a substantive latex, so that it makes it possible to handle these rubber dispersions as if they were acid dyestuffs. By using a one per cent dispersion he gets as high as five or six per cent rubber picked up by the fiber. He has demonstrated a method whereby an aqueous dispersion of rubber latex may be handled like a dyestuff. Experiments also show that water dispersions of synthetic resins may be made substantive by the use of cation active Triton K-60. It has also been found that wool after a pretreatment with this Triton K-60 will pick up water dispersed resins to give an unusually soft and full finish similar to high quality wool.

RESINS FOR GLAZE

Another interesting development has been the production of high *luster* on fabrics, the production of a so-called permanent glaze. This is a specific case where the resins that are used are old and well known resins, but the method of application is new. It is a case of a mill going to work on the problem and controlling the resin and controlling the application to put it where you want it. There is no question today that there are available some very striking and very unique fabrics with a clear washable luster on the surface of the fiber. It is a case of putting resins to work and this development shows promise of going a great deal further than merely as a finish for drapery fabrics.

SHRINKAGE CONTROL

A recent development is *shrinkage control.* Here is another case of having a problem and putting resins to work on it. Sanforizing has done a remarkably good job of shrinkage control, particularly for cotton fabrics. However, when they came to rayon and spun rayon fabrics, they ran into a serious problem since in a great many cases they found it was impossible to sanforize, or get a full shrunk fabric that would stay shrunk. Since finished and shrunk fabrics pulled and slipped, it was absolutely necessary, before they could sanforize certain types of rayon fabrics to resin treat them. In controlling the shrinkage of rayon fabrics a resin has developed and become of increasing importance.

I also want to raise a point which has frequently been brought up, and anticipate a later question, and that is, the *wash fastness* of the resin finish. In one mill, they resin treated a fabric, sanforized it and then gave it five sanforized wash tests. The untreated fabric at the end of the five sanforized washings stretched, or was two per cent out of shape. The resin treated fabric was less than one per cent. There was a change after those five washings, but it was less than for the untreated fabric.

SLIPPAGE CONTROL

Another problem that has had a great deal of study here in New York is the question of *slippage.* Slippage is particularly troublesome on filament rayon underwear slips and taffeta. There again, by selection of the proper resin and application at the right place, it is possible to reduce the slippage with a relatively low concentration of resin as much as ninety per cent. Here is a fabric where the load necessary to slip the fibers is three times as great after treating with only one per cent of resin, and when

two per cent resin was used the fabric broke before the fibers slipped.

But resins are no panacea; no one resin is going to stop slippage of all fabrics. On the other hand, by the development of the proper application of the best suited resin it is possible to reduce slippage to a point where a reasonably high grade fabric can be made slip proof.

RESINS FOR STRONGER FABRICS

In considering the question of *strength,* two years ago I would have said, "We know how to increase the strength of any yarn." Today I would say that, given a specific problem and given time enough to work on it, most yarns can be improved in strength. On the other hand, they may be entirely changed in hand and appearance because for strength you are always approaching the strength of individual filaments when you set all of the individual fibers so that they will not slide past each other. You get greatly increased strength but you may also get a stiffer, firmer yarn. Tough elastic resins show real promise in this field of development.

The problem of producing a *stiff fabric* is a relatively simple one. In the early days, stiffness was an undesirable effect obtained in the development of anti-crease fabrics. Stiffness was what you got instead of crush resistance. That seemed to be due to the fact that they were fixing on the surface of the fiber a hard, brittle resin and by keeping it off the surface, you eliminated stiffness. Today, a number of stiff fabrics are produced by intentionally fixing a hard resin on the surface of the fibers.

Fullness, body or bulk is one of the easier effects to be obtained from resins. I have here a series of fabrics. One of them has ten per cent resin and is softer and less firm than another piece of the same fabric with one per cent of a different resin. It is only partly a question of the physical properties of the resin itself. The softer your resin, the less the fullness and stiffness. On the other hand, even a stiff hard resin when well penetrated into the fiber will give a soft effect.

RESIN FINISHING AT LOW COST

Resins are finding a place as plain finishes for all types of cotton, rayon, silk and wool fabrics. Very low percentages of resins are economically applied to give entirely new low cost finishes which do not affect colors or shades of the most delicate tints. It has been worked out today so that the cost of resin finishing is no greater than the usual fugitive finishes. It has also been found that certain modified resins even in very low concentrations give better strength. It is increasingly evident that resins are being used as finishes, because they are inert materials, because they are colorless, and because they give a finish that can be controlled and applied at room temperature without special equipment.

RESINS FOR PRINTING

In reviewing resin developments, I would certainly be remiss if I didn't discuss the development that has been going on in pigment printing, or, resin printing. There is no question that there has been one of the most striking developments in the past year; this process of fixing a dry pigment on the fiber with a resin. Of course, once again this is not an entirely new idea. After all they have used colored lacquers on fabrics for years, but they have recently developed better resins, they have developed better pigments, and they have developed a better technique of handling the resins, so that today it is possible to produce striking effects by using extremely light-fast, well dispersed, fine pigments with tough, flexible resin binders.

A great deal of work has been done from solvent solution, but there has also been some work done with aqueous dispersions of the resins. Each application has its advantages and disadvantages, and it is probable that we shall see more of both processes. They are not as fast as vat colors for many fabrics and for many types of application. On the other hand, for certain uses they are unquestionably better. We all remember years ago, when we went over from the old pigment colors for heavy goods to vat colors, we sacrificed light fastness and we gained brightness. If we can develop some of the pigments they use today in the lacquer and automobile industry, which are extremely fast to light, we will have gone a step ahead in improving the light fastness and brightness of our prints.

In conclusion, we are not in dire need of any new resins today. What we need is to work out or develop the existing resins to fit textile applications. The airplane industry and the automobile industry are years ahead of the textile industry in this respect. While resins are a long way from being a panacea for textile problems and will not solve all the problems, they are an important tool, and they do have real possibilities. By their proper application it may be possible to modify cotton, to modify rayon, to modify silk and to modify wool, so that we can produce finer, more profitable and better fabrics.

Thank you.

DISCUSSION

Mr. Bell: You spoke of some of the flexible resins. I was curious to know how long they maintain those properties. Do you have any difficulty with them as to hardening later, on ageing, for example?

Dr. Powers: Where your resins are free from volatile or fugitive plasticizers it is possible to obtain resin films that retain their softness even after long ageing. In developing resins for leather finishing it has been necessary to use these plasticizer-free soft stable resins.

Mr. Waters: No doubt you have made quite a number of experiments in the application of resins to a dyed material. Exactly how does that application affect the fastness to light and washing?

Dr. Powers: As a rule it doesn't affect the light fastness at all. Normally, it should affect the light fastness no more than if you put a piece of glass in front of your fabric.

When it comes to wash fastness, in certain cases there is an improvement. As a rule, I would say there is not nearly so much improvement in wash fastness as might be expected. That is because most resin applications are not continuous film applications. In the anti-crease finish there is a slightly acid condition and a very mild reducing agent, and some colors are affected and altered, but the majority of colors are not affected.

Mr. Schmidt: How do these fabrics that are treated with a resin finish react to dry cleaning?

Dr. Powers: I can't speak for all resins—I don't know—but as a rule they resist very well, because at least the most important resins are normally used on refrigerators to make a solvent proof finish. The polymerized resins themselves are completely insoluble in the dry cleaning solvents.

Mr. Waters: What resins are insoluble?

Dr. Powers: The urea formaldehyde types are absolutely insoluble. Certain of the modified acrylates are insoluble in most organic solvents and they can't be dissolved. It is also true that a great many of the phenol formaldehydes are also solvent insoluble.

Mr. Acklis: What type of resins have been found most applicable for the so-called permanent chintz?

Dr. Powers: I had better answer that by saying that the patents that have been issued covering glazes prefer urea formaldehyde. This is an interesting development because this resin is very brittle, and yet it seems to be the most satisfactory when properly applied.

Mr. Acklis: To your knowledge, has any advance been made in preparing permanent chintzes which are not brittle? That is, I have seen some permanent chintz fabrics which simply will not hold up on the sewing machine, for instance, when sewing on cord on bedspreads, where they will rip to pieces. Can that be overcome?

Dr. Powers: I know of a case where the textile mill went to work and overcame that problem.

Mr. Acklis: There is another point. On urea formaldehyde, the complaint is often made that on ageing, for example, the odor of formaldehyde frequently develops.

Dr. Powers: It is interesting that you run into that complaint on textiles, and yet I don't think you run into it in molded urea formaldehyde articles. Where the urea formaldehyde has gone into a light fixture or into molded fittings, you never run into odor. Our experience has been that if any odor occurs it is due to insufficient curing, incomplete fixation of your resin or an acid condition due to the presence of an objectionable residue which is very difficult to remove. Here is a piece of percale that has a beautiful glaze. It was produced eight years ago and no odor has developed. It is a clear, washable glaze.

Mr. Frey: Is it possible to get a plasticizer for urea formaldehyde?

Dr. Powers: I certainly have never seen a good one. Let us put it this way: solvent solutions of urea formaldehyde can be plasticized, but aqueous solutions of urea formaldehyde are much more difficult to plasticize.

Mr. Frey: In your acrylates, what happens when you get down to about 20 degrees Fahrenheit?

Dr. Powers: I think this leather will not crack at ten below zero.

Mr. Frey: You wouldn't want to gamble on that, would you?

Dr. Powers: I am sure that some soft leathers coated with acrylates have withstood temperatures much lower than that.

Chairman Zisman: Has there been any interest, for textile work especially, in the phthalic anhydride type of concentrate? Are there some resins along that branch?

Dr. Powers: There has been a lot of interest in them. We have not been able to get any that are really water white. Do you know of any that are water white?

Mr. Kienle: Oh, yes.

Dr. Powers: That will hold its water white quality over a period of ageing?

Mr. Kienle: It is possible.

Dr. Powers: These alkyds have a good prospect of application in the textile field as they are tough resins. So far as those we have seen which are modified with soy-bean oil, or drying oils are concerned, they take on the character of the drying oil, yellowing, possessing a definite odor. On the other hand, some of them are remarkably tough resins.

Mr. Clarenbach: Does treating the fabric with resin make it any faster to moth-proofing, or help it in any way?

Dr. Powers: I don't know. No, I don't know why it should, unless you use a resin that has an ingredient that is toxic to moths.

Chairman Zisman: Has there been any instance of dermatitis in connection with resin finishes on textile material?

Dr. Powers: I suppose that there must have been cases of trouble with formaldehyde. While normal industrial manufacture of formaldehydes is not considered a hazardous one, there are many people who are sensitive to it. On the other hand, when your resin is completely cured, it is non-volatile, and there should not be formaldehyde to cause any irritation. Under normal handling and normal processing of fabrics there is no cause for irritation, and many of the resins contain no formaldehyde whatsoever.

Mr. Peacock: Have resin treated rags gotten into the paper industry yet?

Dr. Powers: I imagine so. With the millions of yards that have been processed with resin, it stands to reason some of those yards have reached the paper industry. The resin is a part of the fabric and the concentration is usually relatively low except for the anti-crease fabrics.

Mr. Grimm: Can you tell me whether resin can be

(Concluded on page P537)

The Application of Dry Cleaning to Mill Processes*

ROLAND E. DERBY**

THE dry cleaning industry, as probably many of you are well aware, is one of our prominent industries. Every large city and most towns have from one to several hundred cleaning establishments. Some of these do their own work and others send it out on commission.

There are many and various types of machines in use for this purpose, but most of these can be divided into two general classes, identified by the type of solvent used. Class I could include include all solvents of the naptha or Stoddard Solvent type. Class II could include the chlorinated solvents or non-inflammable type solvent.

It is difficult and perhaps hazardous to make any statement as to which class is the most satisfactory in the dry cleaning industry. The supporters of each class claim opposite advantages. However, there are several interesting facts about them both which have great bearing on their use in the mill.

Class I—The napthas are, as far as we know, inflammable to a greater or lesser degree. In order to meet the requirements of safety, the solvents in general use are of the so-called hi-flash point napthas which have about the same degree of safety as ordinary kerosene. That is, they will burn but will not generally explode at ordinary temperatures. In order to have napthas with this degree of safety, it is necessary to have a solvent with a boiling point, considerably above that of water and consequently the necessity for vacuum distillation, if these solvents are to be recovered. In many instances these solvents, due to their low cost, are simply extracted from the goods, filtered and after several uses discarded without recovery. In small batch process cleaning this is the most economical. It is also claimed that due to their somewhat oily nature they leave a pleasing handle to the clothes cleaned by this method. Non-toxic effects are also claimed as an advantage to the operators. The principal advantage of these solvents, however, is their low unit cost.

Class II—The chlorinated hydrocarbons are in most cases not only non-inflammable but their vapors do not support combustion. They cover a wide range of boiling points and several of the most efficient of these solvents have boiling points below that of water; hence adapt themselves very easily to recovery by ordinary steam distillation. They do, however, present some disadvantages, such as hydrolysis and oxidation with water with consequent increase in acidity, presumably due to the hydrochloric acid liberated. This fact makes their application somewhat of a problem due to their corrosive effect on metals. Some of these seem to be better than others and of the whole group, trichlorethylene and perchlorethylene seem to be affected the least by this reaction. They do not hydrolyze and show only slight oxidation effects. The chlorinated solvents also have the property of being toxic to the operator in various degrees. Some of them are even permanently toxic and very dangerous to use. Again, however, we are fortunate in our investigation that the same two solvents which show the least corrosive action also are the least toxic. Men can work in fairly high concentrations of these vapors for short periods with no ill after effects. Operators exposed to direct vapors notice a temporary dizziness which leaves at once in fresh air. The third and greatest disadvantage of this group is their high unit cost. This requires a very efficient recovery system to compete with the low cost napthas. It can be done, however, and the initial cost of the solvent can be considered a forgotten matter.

Now why are we interested in the dry cleaning industry? If you were not connected with the production end of the textile business, you might well ask that question, but you all know without any explanation from me why we are interested—*tar spots*. We have all had them and have been fighting them with every weapon at hand because we had to. Why do we have tar and paint spots! First:—Because the sheep grower has found those materials to be the most suitable to brand his sheep with. Second:—Because wool sorting has become somewhat of a lost art. The fleeces are not carefully looked over and these brands clipped off by hand as was formerly the custom. Of course, it is possible to buy paint and tar free wool but your competitor isn't doing it. Now when we refer to tar we cover a multitude of sins. We include paint, asphalt, creosote, duco and almost anything that will carry a good quantity of pigment and *will not wash out*.

In the woolen industry the fleeces are usually processed with this paint and tar left on the fleece. It is safe to say that probably 90 per cent of this, at least of the paint, is removed in wool scouring and subsequent operations but that remaining 10 per cent can make an enormous amount of specks in a light shade of piece dye flannel.

The mill chemists and chemical manufacturers have thrown together literally thousands of compounds to be used either without or in conjunction with the soap in the

*This is a composite record of the lectures and discussions given before the Northern New England Section, March 10, 1939, and the New York Section, April 21, 1939.

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wet finishing operations for the removal of these specks. Many of these compounds have been very successful and have done a fine job of tar removing, at costs ranging from about one cent to four cents per yard. The cost has been high but it has been a great saving over the original method of having girls speck and clean them out, one by one, over a specking table. The most serious problem, however, has been one of those unseen demons of the mill, uneven color effects. This has shown up in various forms such as streaky, cloudy, shady goods and in some instances to a mixy appearance which could be directly attributed to the perhaps faulty application of the tar remover.

Most of these, in fact, it seems safe to say all of these tar removers have been essentially emulsions more or less stable in reasonable concentrations which would hold a high percentage of some solvent. Xylene, solvent naptha and hi-flash naptha have been among those solvents generally used. These emulsions were not very efficient as soaps, because they had to carry a large portion of foreign matter, i.e., the solvent, in emulsion before any dirt was removed. In other words, their detergent strength based on emulsification was already partially used up.

While these emulsions were for the most part stable in high concentrations practically all of them reached a point of dilution during the rinsing operation, where they broke and we feel sure left fatty acids and other residues attached to the cloth, which we could not find but which gave us subsequent dyeing troubles. This problem was not a persistent one because most of the cloth processed in this manner was satisfactory. Periodically, however, the mill trouble shooters following the back trail of color streaks or other defects found their trail disappearing into thin air at the wet finishing tar removal.

This latter problem, rather than the actual tar removal, is the real reason for our investigation of the possibilities of dry cleaning our cloth as it comes from the loom.

Our next decision must be on the method of processing—Shall it be a batch process or shall it be continuous? Most successful new developments in the textile business have been along the lines of continuous operation. We have all found that continuous systems have many advantages over batch processes such as uniformity, economy and efficiency of production and, as far as possible, the mills are adopting continuous process machinery. For this reason we decided to make our dry cleaning machine of the continuous type.

Having decided on our method, we must next decide on the solvent to be used. This is important, because the actual construction of the machine, its size and rates of flow and recovery plant must be made to fit closely the type of solvent we intend to use. Immediately we can dismiss the napthas or Stoddard Solvent types as their recovery is difficult and must be done by the batch process. It would be difficult to consider a machine wherein a solvent with a boiling point of say 350° F. could be removed continuously in a dryer of reasonable size with steam at 215° F. to 240° F. The low unit cost of these solvents is tempting but their continuous recovery is too difficult.

Consequently, we must turn to the chlorinated solvents, unless we wish to consider some of the low boiling solvents with corresponding low flash points presenting the possibility of a dangerous explosion, and we do not! Naturally our first thought is of carbontetrachloride. It is probably the most common, cheapest and one of the most efficient of this series, in fact, all our preliminary work on mill production was done with the CC14, and the bas theories of our machine construction were founded on the mill experiments conducted with this solvent. However, as previously mentioned, this solvent has two distinct faults; namely, its hydrolysis with consequent metal corrosion and its permanent toxicity. A number of works have been written on the effect of this solvent on the cells of the heart and liver. Its low cost is its only advantage.

For this reason, we investigate further and find that the chlorinated ethylenes, although they cost more, eliminate both the problem of toxicity and corrosion or at least diminish their effect. Of these solvents, we find the same two solvents selected by the dry cleaners to be outstanding; that is tri- and per-chlorethylene. So for the time anyway we have selected the first of these, trichlorethylene because it has a lower boiling point as the solvent to build our mill dry cleaning project around. The ease of recovery of this lower boiling solvent makes it the more efficient. The boiling point of trichlorethylene being 188° F. while that of perchlorethylene is 249° F.

We carried out many mill experiments using vacuum slots, crab rolls, hydro-extractors, pads and other conventional woolen mill machinery. During this time particularly since we used carbon tetrachloride, we all learned what it feels like to become intoxicated from solvent fumes.

Our first plan of construction was to make use of a pair of vacuum extractors followed by a dry can all totally enclosed with means of vapor recovery from each compartment. The first vacuum slot was a wet slot, i.e., a fresh supply of solvent was fed in above the cloth as it passed over the slot to replace that removed by suction. The second slot was a drying slot which extracted most of the remaining solvent before drying over a single drum can. This method was a complete failure. The rate of speed and the amount of solvent which the wet vacuum slot would pull through the cloth was amazing and storage facilities could not be conceived to carry a continuous supply of solvent large enough for the machine. We also discovered that a certain amount of time was necessary for contact between solvent and tar or paint spots before removal could be accomplished. This time seemed to be between fifteen seconds and one minute depending on the type of tar.

Our next experiment was based on the idea of the crab rolls with successive bowls, counter current flow of solvent and squeeze rolls to replace the vacuum slot. The mill experiments carried out along this line in an ordinary crab bowl were so succesful that we decided to build our first machine along these lines. We felt that due to the experimental nature of the problem that we should use iron plate and casting regardless of the expected corrosion in order to save expense. This machine was made for us by Riggs & Lombard and set in one of the mills of M. T. Stevens & Sons Co. away from all other processes and immediately started in operation. Ventilation of the room was provided by a fan at the floor level. This location and also the location of our recovery plant on the floor below the machine is due to the specific gravity of the trichlorethylene vapors in relation to air. They always settle downward unless forced in another direction.

The operation of this machine was at least enlightening if not successful. We found that by running slow enough about one to two yards per minute we could recover almost all of our solvent—our tar and paint was removed and practically all of our lubricating or wool oil. Another thing unlooked for was the almost complete and absolutely even removal of our fugitive stains used for identification of different yarns in the weaving operation. As many of our mill chemists know, this has also been something difficult. Right here we might say that the dry cleaning process does not remove all types of stains but stains can be selected which are removed easily. No trace of tar or paint showed up in the finished goods nor did the finisher or dyer experience any difficulty whatever in finishing or dyeing the goods. This was certainly a successful development even though our machine was very inefficient. At this point we decided to try carbonizing before fulling. Our wool oil was removed so we would not be confronted with the former difficulty of oil distillation in drying and baking compartments, and everything pointed to success. It was just as we expected, an ideal way to remove the burrs and vegetable matter leaving no traces of carbon which are normally held in the fabric after carbonizing by the felted nature of a fulled piece of cloth.

Before we made any experiments along this very interesting line of development, we found it necessary to improve the efficiency of our machine at least to a point where it was practical. In order to remove as much as possible of the solvent before drying over the single dry can, we replaced the squeeze rolls with a vacuum slot. This was the greatest step forward in our development and it is safe to say, the principal factor in making our machine a practical success. Immediately after the installation of the vacuum extractor we found we could increase the speed of our machine from about two yards per minute to fifteen yards per minute on ten ounce goods. This stepped the problem immediately up from the experimental to the practical application stage. This speed would be just a crawl to the cotton mills but it is reasonable production for a woolen machine. We knew now, however, that by increasing our drying capacity, we could attain any desired speed.

Our next problem fell with somewhat of a shock to us even though we anticipated it to a certain extent. All iron parts of the machine which were exposed to the solvent vapors mixed with air set up a serious corrosive condition which made further running of the machine impossible. So much rust was developed that the cloth could not be processed free from rust spots. The top rolls rusted, rust dripped from the roof of the machine and in a week's time, rust and corrosion had absolutely stopped progress. This was due principally to the attempted use of carbon tetrachloride. This solvent hydrolyzed badly and acidity and corrosion increase very rapidly.

Investigation of resistance of various metals to this corrosion was begun and we found a great deal of data already amassed by the solvent manufacturers on this subject. Stainless steel, particularly the SMO variety was found to be entirely suitable so we made covers for all our rolls and all portions of the machine which touched the cloth as well as the entire roof of the machine out of stainless steel. The sides and ends and the bowls not in contact with cloth were metal blasted and sprayed with zinc which was recommended as being reasonably satisfactory. This revision took several weeks to complete but since its completion, the machine has been running every day, usually two shifts and sometimes three, of eight hours each. The only important addition we have made since the vacuum installation has been the addition of a water cooled expansion tank on the exhaust of the vacuum pump. This cooled down the air and vapors condensed most of the vaporized solvent and passed the cooled air and entrained solvent back into the machine. In this way, we do not lose the 5-7 per cent of solvent which would normally be carried off with the escaping air. At the same time we keep down the general temperature thus avoiding unnecessary vaporization of the solvent. Efficient operation of the machine is now in progress and the cloth is cleaned thoroughly.

Now that we have a continuous dry cleaning plant as an addition to our many other textile processes, what advantageous possibilities does it present? I have outlined the following as outstanding:

First: It is the surest, safest, and most economical method, of removing tar, paint, oil, stains and many other extraneous substances present in the cloth after weaving.

Second: It is possible to leave the cloth in a perfectly clean condition for subsequent operations. We have no wool oil present hence, our soap has but one duty—*felting!* Certain finishes require soap.

Third: It opens the way for simpler and quicker means of scouring. In the past we have all experimented and some of us have adopted so-called cold water soaps. They have been very interesting due to the saving in steam and hot water anticipated from their use. As a general thing,

however, either these soaps have been inefficient as scouring agents or we found their rinsing properties very unsatisfactory. Here now we have no dirt or grease removal to speak of so a cold water soap is not only a possibility but is just what we want. Even the fatty alcohols will remove all remaining traces of dirt or stain in very dilute concentrations and rinsing for long periods of time becomes unnecessary.

Fourth: Fulling now can be done without consideration of dirt removal at the same time and new methods already known such as acid fulling can be applied to many of our fabrics. In some cases, if soap was found necessary for a certain finish, the amount required would be far less than that necessary to full a greasy piece and in no instance would the addition of more soap be required for scouring operations.

Fifth: The possibility of processing certain types of fabrics such as worsted crepes direct from the dry cleaning to the dyehouse is now a fact. These types of fabric have never been satisfactory due to the breaking up of the threads in wet finishing operation with a resulting fuzz instead of a clear finish where tar removal has been necessary on these fabrics, the results have been disastrous.

Sixth: The elimination of at least one of our major dyeing problems, those streaks, clouds, shady places and mixy appearances which have seemed to come directly from our wet finishing operations. The dyer now gets a clean piece of cloth not only whiter and more free of oil but also carrying practically no soap or fatty acid residues to cause him trouble.

Seventh: It becomes unnecessary to use large quantities of alkali in processing the goods to saponify wool oil, build up soap body, etc., consequently the wool cloth is not exposed to the known disastrous effects produced by the action af alkalies. We are inclined to believe by our experiences and by the results of the research work conducted by our A.A.T.C.C. under the direction of Dr. Harris, that wool's chemical character is a very sensitive one and can be changed appreciably by the actions of either alkalies or acids. The result is increased or decreased affinity for dyestuffs. This we know takes place in our various mill treatments. A reprocessed wool reacts very much differently than a virgin wool. And cloth having been exposed to large amounts of alkali is very much more sensitive to the action of acids or dyestuffs than cloth which has seen little or no alkali in its manufacture. The constant reversal, first to the alkaline then to the acid and back to the alkaline state, opens the way to uneven chemical conditions of the wool fibers which shows up in the dyed material. This is now minimized and in some cases could be eliminated.

Eighth: The increasing demand for lighter and brighter shades is made somewhat simpler. The elimination of carbonizing residues as well as a whiter and less yellowed piece of cloth gives the dyer a little more leeway on his light bright colors or so-called pastel shades.

Ninth: Time of wet finishing operations can be reduced to unbelievable proportions, thus increasing production in a department where the goods just cannot lay around for any length of time.

Tenth: Reprocessed goods for stains or oil spots may be cleaned safely and quickly without harm to either the finish or the dye.

Eleventh: Savings in the use of wool oil will pay for the machine if nothing else is considered. Very low priced oils in the neighborhood of ten cents per gallon are as good as our present fifty or sixty cent oil.

Twelfth: Even in the burling and mending, we find a single girl able to mend and burl three to four times as many pieces after cleaning as she was able to in the grease.

Thirteenth: Last but not least by any means, it is a great step forward in the elimination of stream polution. The soap liquor residues usually dumped into our rivers every year is enormous and is without doubt one of our important forms of stream polution. Steps are being taken each year to improve this condition and it is one of the major problems which the chemist of the future will have to face.

* * *

ACKNOWLEDGMENT

Let me take the opportunity at this time to express my appreciation for the assistance and cooperation given me in this work by the M. T. Stevens & Sons Co. for their financial support to such a wild scheme, to Mr. Harold Wilcox of Riggs & Lombard for his very efficient machine designing and to Mr. A. G. Hamilton of E. I. du Pont de Nemours & Co., Inc., for his engineering assistance.

* * *

At this point I have some slides which I would like to show of the machine, and plans of the machine, which will explain it to you a little further.

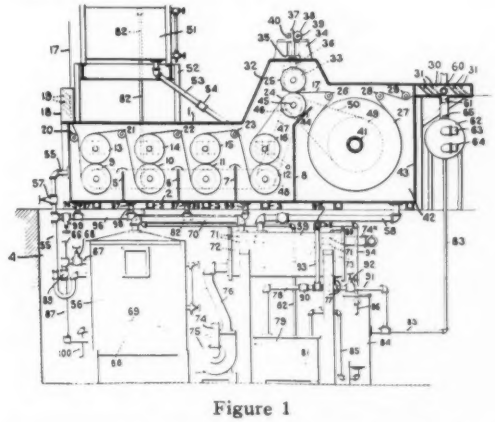


Figure 1

Figure 1. This is the diagram of the first machine that we built, as I described to you before. You will recognize the crab roll idea. Our cloth enters at (19) through a seal which is simply felts laid against the cloth. We have since improved that seal, by the way, by using stainless steel

metal fingers which open up to let the cloth through and close up where the cloth does not go through. The cloth comes down through this first compartment at (20), which is an ordinary boxlike compartment. The height is shown by the cross-sectional lines. It goes around in figure 8 style through the squeeze rolls just the same as your crabbing operation, over into the second bowl (6) which is an inch higher than the first bowl (5) and of course you get a flow of solvent over (5) and (6), and out through the outlet (55) which goes back to the still and is recovered by ordinary steam distillation.

This machine has four bowls, (5), (6), (7) and (8), and these bowls hold, when they are full, between three and four hundred gallons of solvent. That was one of our big mistakes in the first place, having so much solvent in this machine. It is hard to keep that solvent clean, and as I will show you in another diagram, we have improved on that.

The cloth leaving the last bowl goes up through these squeeze rolls (24) and (25), which, as I described to you before, have been replaced with a vacuum slot. Those squeeze rolls did not extract enough of the solvent from the cloth so that the one dry can could take care of it except at a very slow speed, as I said, of about one to two yards a minute. This one dry can (41) which is a steam-encased dry can, is built out of iron and tinned over, and we have had a lot of corrosion trouble with that, but it is still running. It isn't very serious at all. This is a 36-inch dry can, a little larger than is generally used, but, as I will show you later in another slide, we have used smaller dry cans to get great efficiency.

At the end of the machine we put in a steamer (62). As the cloth leaves the dry can it comes out through the sealed felts (31), supposedly dry of solvent. It holds considerable solvent, and we thought at first that by just blowing steam down through the cloth at (60) we might be able to separate what little solvent remained in the cloth and condense it in this condenser (62). However, that didn't work out successfully, and if we stopped the machine at any time the moisture and steam present at (60) set up a very serious corrosive action. So we just eliminated it entirely. It still has some possibilities, but it will have to be done in a little different way than this.

The still (56) is simply an ordinary cast iron cylinder. I believe it holds about 280 to 300 gallons of solvent when it is full at the top level (67). Closed steam coils (69) keep the solvent boiling all the time, and there is a constant recovery during operation of solvent vapors which go over through the pipe at the top (70) into the condenser (59) and are condensed. After they leave the condenser they go down into the separating chamber (84) which separates any water that might have been collected during the operation; there always is considerable water floating on the top at (86). That water is separated at (86), and goes out through the overflow at this point, while the trichlorethylene, being heavier, pushes over at (85) and goes over into our sump tank (79). This sump tank is simply a means of collecting the solvent at this point, and is pumped back into the storage tank (51) at the top of the machine where a fresh supply is constantly fed down through the pipe (54) into the last bowl of the machine. This is the clean solvent. It gets a little dirtier in No. 7 bowl, and our first bowl (5), of course, is the real dirty solvent, which we recover.

We have a pump installed at (75) to increase the speed of water going through the condenser in order to give us better cooling capacity.

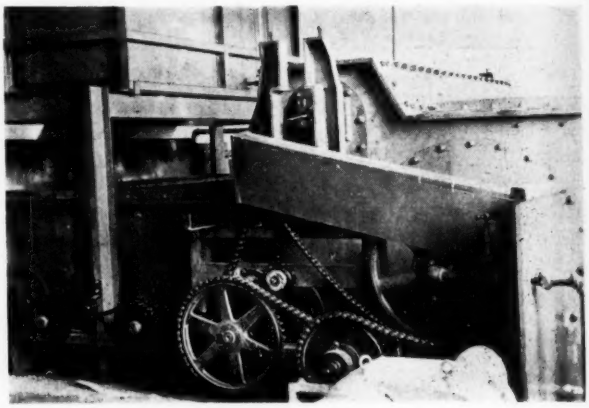


Figure 2

Figure 2. This is a picture of the machine itself, as it is in operation. It is rather crude. I think the new development which we have in progress will be a great improvement, in appearance, anyway, but of necessity it has to be all-enclosed, and we felt that it ought to be very carefully enclosed, so we put a great array of bolts along each cover so we knew we could get them off, also so that it would hold them down tight, and let me tell you those bolts have been a nuisance because we have had those covers off hundreds of times, and there are a lot of bolts to unscrew.

However, the drive is simply a chain drive which is regulated by a variable speed motor, and we can increase the speed of the machine to accommodate any weight of cloth or any type of cloth. The uprights which were originally the squeeze rolls—you will notice we have replaced with the vacuum slots. You can see the end of the vacuum slot just protruding from the machine. It is simply a three-inch stainless steel pipe with a slot cut in the top of it and suitable supports made so it won't collapse.

The wire handle at the end of the vacuum tube is a device which we found we had to make to the vacuum slot. Of course where you use vacuum slots at the mill and you can get at them it is a simpler matter to clean flocks or other refuse out of the slot, but when it is all-enclosed, and particularly with all these bolts (laughter) it is hard to clean the flocks out of a vacuum slot, so we put the rod

in, which is more or less of a cleaning rod. Perhaps that idea comes from my hunting experience, but it is a rod that goes into the end of the slot and there is a little raised portion that fits in the top of the slot. You simply draw the rod out and clean the flocks out of the slot and shove it back in again, and it seals itself. That has been a great help.

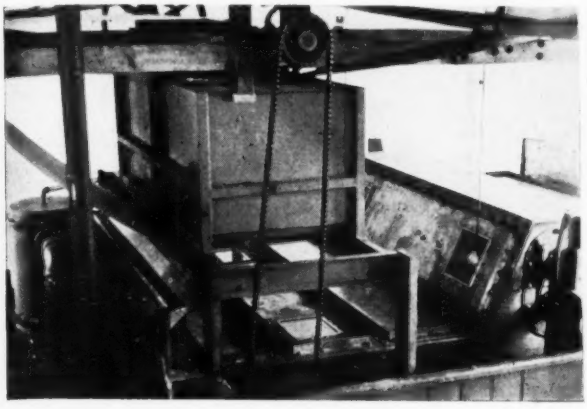


Figure 3

Figure 3. This is simply another view of the machine looking down on the top. You can see we have covers with the glass doors in them so we can look down and see anything that goes wrong. We have lights inside the machine so that it is illuminated all the time and you can see the cloth passing through; particularly at this point we have the lights outside so they will shine in on the cloth and we can see that passing over the vacuum slot. The seals on the vacuum slot have been a serious problem to us. We have now simply stainless steel springs with a felt which lays over the top of the cloth, and if the cloth slides over under the edge of the felt, it seals itself right at the edge of the felt. However, in some cases when the operator isn't quite paying attention to his work he is apt to get the cloth off a little to one side and you will get a three- or four-inch opening in the slot, and of course the pressure goes down considerably.

We have a new seal which was built for us by the Lamson Company, which is a very efficient seal, and which is installed in our new design. The tank near the entrance is the cooling device which I mentioned, as the vapors come from the vacuum slot. There will be another view later which will show it a little better.

Figure 4. This is the recovery plant which is located, as I said in the paper, on the floor below the machine. The reason for this is because of these heavy vapors. It is easier to make them go down than it is to push them up.

The still is insulated to keep heat down but it is simply a cast iron or sheet iron cylinder with a clean-out place on the side. Every two days we collect at the bottom of this still by means of a draw-off valve, about 30 gallons of residual oil and dirt which we collect in drums. I have a sample of that residue which I will show you later.

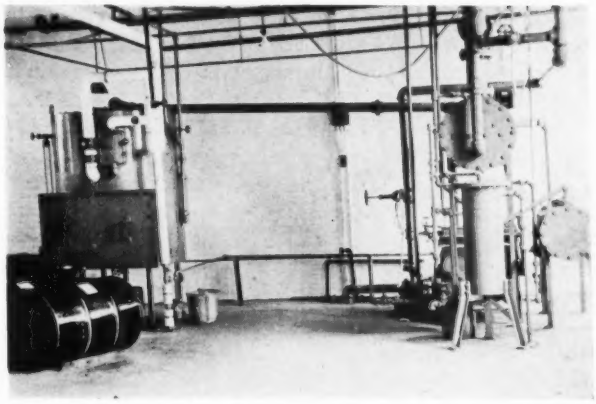


Figure 4

I am sorry to say I haven't yet found a use for the residual oil, but it must have some use. At least, it will burn.

The big pipe is the pipe coming down from the bottom of the drying chamber, and the vapors settling down through the pipe settle down into the condenser and are condensed along with the vapors continuously being distilled from the still.

This view also shows the water separator and its water outlet which goes over into the sewer. The trichlorethylene settles to the bottom and is drawn off a little lower than the water outlet. As this separates, the water is forced into the top of the tank and is pushed out the overflow.

We took the condenser which I showed you as in use on the steamer at the end of the machine and put it down as an extra cooler. We built the condenser twice as big as we thought we needed, but we found that it still did not cool off the solvent sufficiently so that there was considerable vapor lost from it as it came in contact with air. Therefore, we put the cooler in and used the same supply of water and cooled the solvent further before it went into the separator.

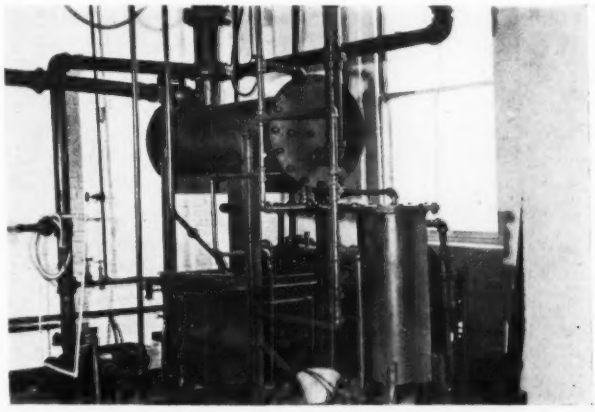


Figure 5

Figure 5. This is simply another closeup view of the condenser and separator. It shows the sump tank a little

better where the trichlorethylene comes up through the pipe at the bottom of the separator, and over into the sump tank, and is pumped upstairs into the storage tank. We have a mercury switch with a stainless steel float, inside the tank and the mercury switch outside to regulate the running of the pump. As the sump tank gets filled up to a certain level, the mercury switches tip over and starts the little pump, and puts the solvent back up into our storage tank. It is fully automatic, and in fact we have two mercury switches, one of which is to light a light or ring a bell, or in some other way acquaint the operator who is upstairs with the fact that the pump didn't operate. If the electricity should go off or a fuse blow, or something else, and the tank got full, of course it would back up and eventually reach the overflow level, and go over into the sewer. Well, with solvent at $1.15 a gallon you can't afford to have much of it run direct to the sewer. So we have put on an indicator to warn the operator if that happens.

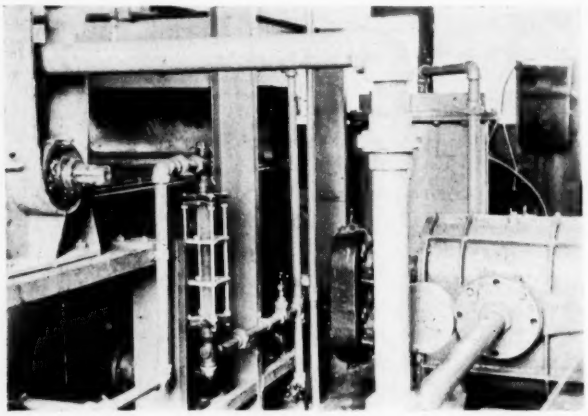


Figure 6

Figure 6. This is another view of the other side of the machine which shows the entrance of the solvent into the machine. We make use of the ordinary rotometer which is calibrated for this specific gravity of solvent, that is, trichlorethylene, in gallons per hour. There is a little stainless steel float which rises to any height marked on the glass tube by calibration, to indicate the flow of solvent through the pipe, and into our last compartment of the saturating tanks. The amount of solvent flowing through the pipe pretty well regulates the clealiness of the cloth, because this is what regulates the cleanliness of that last the pipe pretty well regulates the cleanliness of the cloth, will be clean as it comes out. But if the solvent doesn't flow through fast enough the grease content gradually builds up and will reach a point equivalent to the flow through the rotometer.

This also shows our vacuum slot going into the machine from the other side. We have an old Sturtevant evaporator pump in use. This pump is antiquated in a way because I don't believe it is made any more today, but we had this pump available and so we used it, and it has worked out very efficiently. It is a geared pump in contradistinction to the usual type of pump, the Nash pump or some of the other pumps, which require a liquid seal to seal their vacuum. This pump is a gear-driven pump, or a gear pump, and requires no liquid outside of the liquid coming through the machine to seal it. We contemplated using a Nash pump but in order to do that we would have to circulate about fifteen gallons of solvent a minute through the pump to make a seal, and so we have made use of a pump similar to this in our new machine.

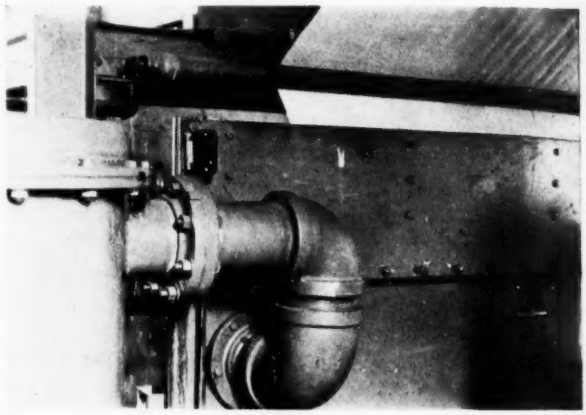


Figure 7

Figure 7. This is the device which we attached to the end of the vacuum pump and cooled off the vapors coming out of the vacuum pump and condensed all the solvent possible; and then took that air and the entrained solvent, put it right back into the machine again. In that way we avoid that great loss of solvent which we would have if we spilled that air at this point. This causes a little trouble due to the fact that the outlet of the vacuum slot or exhaust from the vacuum slot creates a greater pressure than the suction at the other end of the vacuum slot. Consequently there is always a slightly greater pressure in the saturating tank's compartment than the atmosphere, and we get a slight amount of solvent vapors coming out from the cloth entrance. They are not serious. In fact, as you enter the room, you would hardly recognize the odor of any solvent. But I think we have now available an idea to recover these vapors without putting them back into the machine, which will be a great improvement, I am sure.

Figure 8. This shows in pretty good detail the cloth entering the machine as it comes from the loom dirty and greasy, and a brown stain on it for identification purposes, and the cloth leaving the machine clean of grease, clean of stains, and tar and paint free. That of course is slightly exaggerated due to the fact that in taking this picture the cloth was a little bit in the shadow, as you can see the difference between the shaded and light places.

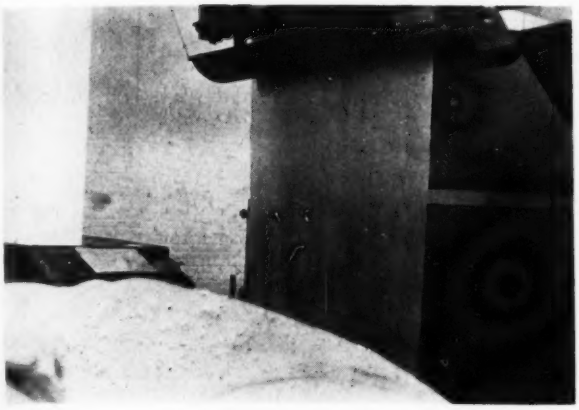


Figure 8

However, I have some cloth here to show you, and you will see that that contrast isn't particularly exaggerated. It is an amazing result to see this dirty cloth go in and in a very few seconds come out very white and clean.

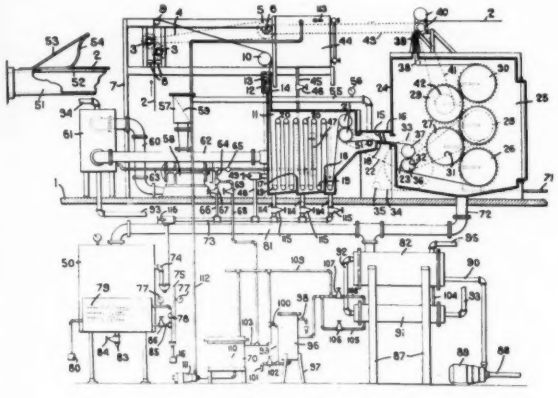


Figure 9

Figure 9. This is a diagram of our new development. We have built another machine and I hoped to be able to have slides showing you that machine in operation, but the machine is being installed in one of our other mills and it will be a week before it is in actual operation.

Now I will cite some of the improvements or changes, anyway, that we have made. It is perhaps unsafe at this point to say they are improvements until we try it, but we feel they will be great improvements in the construction of the machine.

The cloth enters at the same point as before, through the seals which, as I told you, are now stainless steel fingers (13), and instead of going through the crab rolls which we found were not necessary (that squeezing action was not necessary at all), the solvent does its work very efficiently without the use of squeeze rolls. It passes over ordinary small idler rolls (20), and in that way we can have more cloth in the machine and longer contact with the solvent in the same area. That gives us a chance to shorten up the machine from front to back and cut down the size of the soaking compartments (17 and 18), which is very essential because this machine is all made out of stainless steel and the cost of material in there is appreciably lessened.

In this new machine, instead of three or four hundred gallons of solvent in the soaking tanks, we will have between seventy-five and a hundred gallons. In that way we can flow our solvent faster through the machine and keep it cleaner. We have also made the last compartment (18) a small compartment so that the fresh solvent coming in will keep that compartment very clean. In fact there will be practically fresh solvent all the time in this last compartment where the cloth is immersed. The cloth then passes over the draw rolls (21) which are simply draw rolls—they are not there for squeezing purposes—they will of course squeeze out some solvent, but their essential purpose is to keep a constant tension over the vacuum slot (51). As the cloth comes over those draw rolls and over the vacuum slot the other draw rolls (36 and 37) synchronize with them so that a constant tension is kept across the vacuum slot at all times, and, as I said before, the vacuum slot is sealed by the Lamson Seal which perhaps some of you know.

The vacuum slot compartment is sealed off by felts (15), that is, the vacuum slot and the solvent compartments are sealed off from the drying compartment so that we may keep this compartment absolutely cool if we so desire. On the other hand, we have found that for certain purposes it would be perhaps advantageous to heat up this solvent, and we have included steam coils in the first two compartments to heat the solvent if necessary. For most woolen purposes or worsted purposes, it is very satisfactory to keep this solvent cold.

Our drying compartment (35) has grown with the reduction in the saturating compartment. We have now five dry cans (26, 27, 28, 29 and 30) instead of one; although they are smaller dry cans, they are only twenty-three inch dry cans, we have used five to consecutively heat the cloth. In other words, we probably cool off the first dry can greatly, the next dry can won't cool off so much, and so when the cloth gets near the top, it will be pretty nearly dry, and we hope that by so doing we will have cloth coming out at the end of the machine that is practically free of solvent.

We built the dry cans in a vertical stack rather than horizontal, in the first place because they take up less room, in the second place because in this position the solvent is pressed down due to its own weight into our exhaust pipe (72), and hence into the condenser (82). Our condenser of course is just exactly the same as in the other with the cooling chamber (91) at the bottom of it. The separator (96) is identical. That has been very satisfactory. And our still (50) is exactly the same as the original plan. We have made the condenser a great deal larger for two reasons. We hope to increase the

speed of this machine over the original speed of 15 yards per minute. We hope to get 30 yards per minute out of this machine. Consequently we will have a great deal more solvent being evaporated and we will need a larger area to condense it. We have built it therefore so that the actual radial surface is nearly four times that of the original machine.

The cooling device is exactly the same as it was before, and our vacuum pump is the same as it was before.

The two little rolls (3) at the entrance of the machine are simply brushes, just ordinary brushes, the same as the brush on a shear or a napper, bristle brushes. The cloth passes up through these brushes on the way to its entrance to the machine in order to brush off loose fibers, loose filling ends or other loose material which would normally clog up our vacuum slot or clog up the outlets from the overflow (49). We have also made this overflow (49) a little larger with a flock-catching device to take care of any flocks or other refuse that goes over with the solvent to be cleaned.

I have some samples here which, if you are interested at all in the process, you will want to see.

As I showed you in the picture, the stained cloth going into the machine—I have a couple of pieces of flannel as they come off the loom, with the grease and dirt on them, and I have the same flannel as it comes out of the machine. That is not greatly exaggerated in the picture. There certainly is a considerable difference in the amount of color and dirt on them after they come through the machine.

This sample was a very troublesome sample, as you will see if you come up and look at it. It has large nubs in its design. The grey cloth shows it a little better. These nubs had considerable stain in them. You can perhaps see them even from way back there. It was an awful job to get that stain out in the ordinary fulling, or scouring process, but when they come through the machine, there is not a single sign of stain left on them. They are absolutely clean. When this fabric goes to the wet finishing room there is practically nothing to do to it except to finish it.

This fabric is one of the interesting phases of the machine. It shows two things: The stain removal, and also this is a fabric which has very little wet finishing operation to it. Our desire in this fabric is to produce a fabric which has a certain crisp handle and open weave, and we don't want to break up the threads. In order to clean tar and paint out by the ordinary fulling operation, with solvent and oil and so forth, you have great difficulty in keeping a fabric like this from having the threads broken up and getting that soft sleazy handle which is detrimental to that type of fabric.

The same fabric is here as it comes out of the machine from the loom, and also as finished cloth, finished and dyed cloth.

The removal of floor dirt was something we were quite surprised at, and the only reason that we do remove it is because of the mechanical action of the vaccum slot. Of course, the floor dirt is not soluble in solvent, but much to our surprise, ends like this—this is the very same end cut off right next to it with a great big spot of floor dirt on there which was caused by somebody stepping on it with his dirty feet—came out perfectly clean.

The residue, of which I have a sample here for you to look at, is composed of about 55 per cent of oil, residual oil, and 45 per cent of actually solvent insoluble dirt. This is part of the dirt, these floor stains and so on. That particular fabric is a paper-maker's felt, waste fabric, which has been somewhat of a problem—due to the fact that there is a considerable residue of alum and grease in the fabric, and it kills the soap very badly. We note that after it comes out of the solvent machine a very small amount of soap will build up a good lather, and we have no difficulty whatever in cleaning it. I have a finished and dyed sample of the same fabric which you can see.

I also have two samples here of flannel after being fulled and scoured—and when I say "scouring" that scouring operation is about a fifteen-minute operation. Due to the operation of fulling and other travels through the mill the cloth might have accumulated a little dirt, and it is usually necessary to scour the pieces to a certain extent after fulling. For this purpose our cold water soaps are very efficient. You will see these two fabrics here as they have been fulled and scoured and also one fabric has been fulled with acid. The other fabric has been fulled with soap. Perhaps some of you people who are used to handling cloth will be interested in seeing if you can feel any difference between the two. They are marked. I have the same two pieces finished in the same shade, and you can compare those also.

Another thing that we have done with this machine is to use a straight mineral oil, ordinary crankcase oil for a wool lubricant. There is no emulsifier with it. It isn't necessary. It is perfectly soluble in solvent, and our wool oil problem is now simply one of lubrication. This fabric was lubricated with a mineral wool oil which we bought from the Tidewater Company. We paid nine cents a gallon for this wool oil and it was perfectly satisfactory. I made an ether extraction of this piece of cloth and the ether extraction is .05 per cent. You know if you are used to that work that .05 per cent on a woolen flannel is very low for an ether extraction. I have that same piece of cloth finished and it still showed approximately the same ether extraction.

These other samples are simply other pieces of flannel, some of them acid fulled—most of them are acid fulled because on our flannel work we find the acid fulling very satisfactory.

This is a finished piece of that fabric I spoke to you about with the nubs.

I have some other fabrics—men's wear, and women's wear fancy dress goods. This was a very interesting

fabric for this reason: In weaving the fabric they got some of the yarn lots stained a little heavier than others, and they looked just about like that in the piece, I mean there would be filling bars—it looked like filling bars anyway, with a heavy stain here and a light stain here. It was a very difficult problem to get that stain to come out evenly in the light scouring operation which this fabric had to have, and it was a great help to put this cloth through the machine and have it come out absolutely stain-free. We eliminated what we had been troubled with, that is, filling bars. I don't mean filling bars that are mechanical filling bars, simply filling bars which showed up from this stain in the cloth.

This is the mineral-oil-lubricated flannel in the grease, and I will lay that right here with the other so you can see them when you come up.

There are several other fabrics, including a fine suede. This is of interest because that is one fabric where I do not believe it would be satisfactory to full with acid. In suede finish you want a nice soft spongy handle to it, and soap does that. Acid fulling sets the fabric up so hard without breaking up the fibers that it does not give a satisfactory handle in a fabric of this type. So for purposes like this it will always be essential to use soap for fulling operations.

Here is some union autocloth which was cleaned in the machine and was very satisfactory.

Here is some heavier cloth, our so-called Kensington Tweed which has been a fairly popular fabric, and it is of interest because it is a heavy type of fabric and presents some cleaning difficulties.

It wouldn't be right to tell you about all this success without telling you something that wasn't a success. I have two fabrics here which are mohair plushes, and while I am not free to state whose plushes they are, they are not ours. We are not in the plush business. The people were very much interested in the solvent cleaning of their cloth and the solvent cleaning was very successful. But in processing their plush they desire to muss up that pile so that the weave or lines in the cloth won't show, in other words, they want to spoil the fabric partially, in processing. Well, they don't do it when they solvent-clean it because they don't disturb that fiber at all and the finish shows these filling creases across the fabric, which show up very badly. If anybody here is in the plush business I know he will be interested in looking at these.

DISCUSSION

New York Section Meeting

Mr. Lindsly: Does this process remove sizing material as well as the scouring process?

Mr. Derby: Mechanically it does, just the same as it removes dirt and stain, floor dirt and so forth; when you have loosened up the oil in the cloth, mechanically the vacuum slot sucks out a large amount of size in worsted materials and so forth—I presume you refer to that?

Mr. Lindsly: Yes.

Mr. Derby: It does take out a lot of it. Of course the size is not soluble in solvent and it is only a mechanical action that takes it out.

Mr. von Bergen: I want to congratulate Mr. Derby on his talk because it is very seldom that we have the privilege of hearing such a valuable talk on a problem in which the wool industry is very much interested.

I don't know if Mr. Derby is acquainted with the fact that about ten years ago a firm in Berlin, Germany, made quite a big stride in the same direction. They have used trichlorethylene for the same purpose, and I think you would have gone right to your second solution much earlier if you could have had access to the information they published, because they used the same principle you made use of the second time, using carbonizing rolls. You have a continuous run. In the second method you have actually no pressure on your cloth and I am wondering if you are still able to remove all the grease in the same fashion during that short time without any pressure at all on your cloth, i.e., no mechanical action at all.

Mr. Derby: Of course, I can't answer that question definitely. We have done enough experiments to feel sure that it will be accomplished and that the one squeeze roll action there in front of the vacuum slot, plus the mechanical action of the vacuum slot, will be sufficient. However, in another week's time I can tell you for sure about that, when we get the machine in operation.

Mr. von Bergen: What kind of tinting colors did you use?

Mr. Derby: We have used vat colors and also paper dyestuffs or paper dyeing pigments, for our cleaning purposes. The vat dyestuffs come out very easily, and the pigment dyestuffs—tapestry printing dyestuffs which we buy from General Dyestuff Corporation—come out very satisfactorily.

Mr. von Bergen: If it is not asking you too much, what is your price per yard on this operation?

Mr. Derby: Well, the price per yard in this first machine is between a half cent and three-quarters of a cent per pound of material going through the machine. We know that is inefficient and we can cut that cost down, but even at that the saving is so great that they run the machine faster than it should run and take the cloth out of there faster than they should because they can almost afford to waste it, but our new machine will certainly show great efficiencies over that. I don't think there is any question of doubt but what we can cut that cost down to a very small fraction of a cent. That is simply and entirely dependent on our efficiency of recovery. If we improve our recovery efficiency we can cut our costs down. Just how far we can afford to go with that and how much money we can spend on machinery for recovery is something that will have to be balanced.

Mr. Derby: I might say this: That somewhere in the group here is Mr. Hamilton of the du Pont Company,

(Continued on page P537)

Tomorrow's Textile Dryers*

B. R. ANDREWS**

DRYING can become a powerful aid to the textile colorist and chemist in producing the fibers, fabrics, and finishes which tomorrow's consumer will demand. It also represents from 15 to 40 per cent of the cost of finishing, and consequently offers great possibilities for savings in manufacturing cost. Proper drying and drying equipment are vital for both quality and economy in textile manufacturing and finishing. Fortunately, in the majority of instances the type of drying cycle which produces the maximum of quality characteristics is consistent with the design of equipment which provides the highest operating efficiency.

From raw stock to finished fiber, whether linen, cotton, wool, silk, or any of the synthetic fibers produced to date, a reduction of the drying time enhances quality characteristics in practically every case, provided proper limits of temperatures are recognized and contact with heated drying surfaces is avoided. This fact is fundamental to textile dryer design, and demands proper disposition of the material in the dryer for efficient application of the drying medium.

High operating efficiency may or may not utilize the highest possible production per drying unit, because lowest drying cost per yard involves many items other than heat and power. But within reasonable limits the most yards per minute and the most pounds per hour are consistent with the lowest cost per pound or yard, provided speeds are confined within limits of practical operation and control, of dryers or machines in range with dryers.

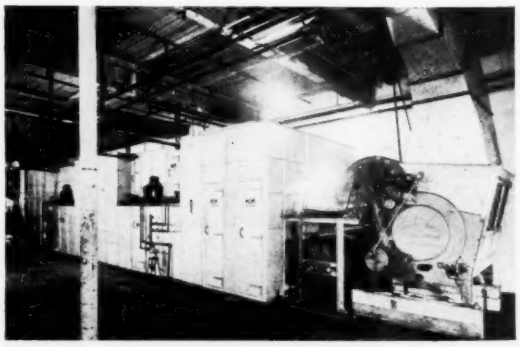
The textile colorist and chemist has helped to produce better and better fabrics until the consumer has seen and recognized enough use and desirable characteristics to demand them and expect more. Fast colors, shrunk goods, permanent finishes, resistance to creasing and soiling, are here to stay. New methods of producing these characteristics and new fibers yet to be developed may be tomorrow's method of securing business at sufficiently reduced cost to provide for increased taxes and wages without the much needed increased selling price. So tomorrow's dryers must, more than ever, be looked upon as a very important manufacturing unit for getting the finish and reducing the cost. The successful design and use of such dryers will necessitate cooperation of the textile colorist and chemist with electrical and mechanical technicians from both the supplier and the user of the materials and equipment. Cooperative work by groups thoroughly capable and experienced is required, and some exchange of ideas among plants is essential. The probable gain has every indication of being worth the effort.

It is proposed in this paper to outline the probable characteristics of tomorrow's dryers used in the preparation of woven goods, and show ways in which these features can or have been combined into workable units; then to indicate the combinations that appear most likely to give best results; to determine the most economical production per unit and to outline a method of checking actual production against possible capacity.

Fundamentally, a dryer is a means of supporting or conveying goods and a means of supplying the heat of vaporization of the water in the goods. The mechanism for disposing the material should be as simple as possible, to hold the goods in the best position possible to secure the dimensions and character desired, in such a manner that the drying medium can be applied most efficiently. Steam will continue to be the medium for supplying heat to dryers except in special cases. It is safe, and easily controlled. Plants are equipped to generate and use it efficiently.

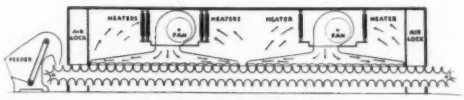
The Stock Dryer will be considered first because it is the first dryer which the natural textile fiber encounters. Like all manufacturing equipment it must be easily accessible throughout, both by the operators and the mechanical department. It must occupy the minimum of floor space, the drying must be fast, even and uniform, in order that the stock may be in the best possible condition for the next operation. The dryer itself must be self-cleaning so that grades or colors can follow each other without interruption, or the possibility of blending left-over particles of one run with the succeeding. Figure No. 1 shows an equip-

Figure 1



* Presented at meeting, Piedmont Section, Feb. 11, 1939.
** Andrews & Goodrich, Inc.

ment that has proved capable of securing all of the desired results in large or small capacities at high operating efficiency. The mechanism is shown by Fig. No. 2. Stock is



LONGITUDINAL SECTION

Figure 2

metered in equal amounts to the round bottom perforated buckets and the air is applied as shown by the diagram Fig. No. 3. It will be noted that the bucket containing the stock moves forward while the air delivery slot remains stationary. By this means velocity first drives the drying medium down the leading side and under the stock, lifting and turning it slightly. Second, it passes downward through the small quantity of stock in each individual bucket, impacted in a line that moves steadily across from the leading side to the other, where finally the air is driven down the following side and underneath again for uniform drying and further slight agitation. The cycle is repeated completely each foot of travel throughout the trip through the dryer. The edges are tightly sealed against leakage of air or stock, as shown by Fig. 4.

Figure 3

Figure 4

When the bucket reaches the delivery end the stock is dumped clean and no pockets or recesses exist where some material can remain to mix with later runs. Nor can any stock inside the dryer housing reach the buckets by the way of the air stream, because air entering the heaters is thoroughly screened.

The next step at which drying takes place in worsted manufacture is after washing of the sliver either white or top dyed. Here three definite types have been developed to meet the probable requirements of tomorrow's preparation of the top. Figures Nos. 5 and 6 show the type best suited to produce a lofty sliver where the ends hang in loops and the individual fibers are free to take their natural position and shape. Figure No. 7 illustrates an excellent type of dryer where straight fibers are required. The cylinders are heated, but spaced far enough apart and frequently enough to permit the material to be ironed without over heating because of cooling from air drying between them. Figure No. 8 shows an apron type where by variation of tension the sliver can be delivered with some of the loft of the loop dryer or some of the straightness of the hot cylinder dryer and yet have the benefit of fast drying. Refinements of these three will probably take care of top requirements for some time ahead.

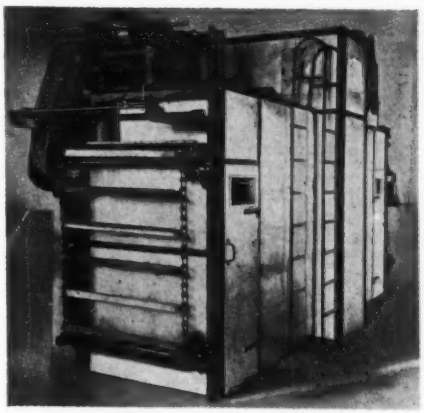


Figure 5

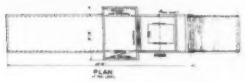
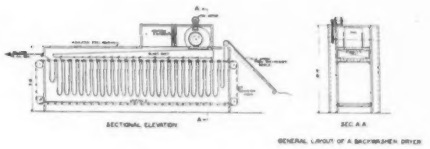
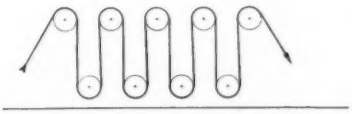


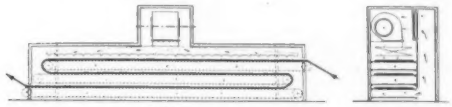
Figure 6





WARP DRYER

Figure 7



BACKWASH DRYER

Figure 8

At no stage in the manufacture of textiles is the character and cost of cloth affected by the drying operation more than in the preparation of warp for weaving. Tomorrow's warp dryer will undoubtedly lead away from the drum type where the yarn is in contact with heated cylinders toward the all air type or a combination of the two. The dryer must deliver the warp to the head so that each individual end is strong, round, smooth and lubricated in order that maximum production on the loom of perfectly woven goods is possible. The necessity for painstaking and careful development of this dryer is increased by the growing use of long draft spinning. Figure 9 shows an all air dryer for fast drying that has proved highly successful in worsted warps. Figure 10 shows the method of disposing the warp and application of the drying medium. Dryers of this type can operate at any speeds which developments of slasher heads are likely to permit.

Because the great majority of cotton warps are now dried after sizing on cylinder slashers and the investment

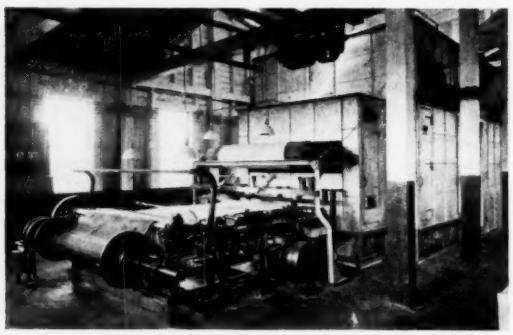
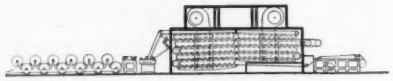


Figure 9

Figure 10



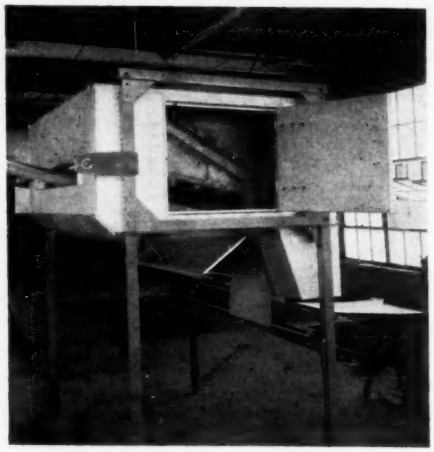


Figure 11

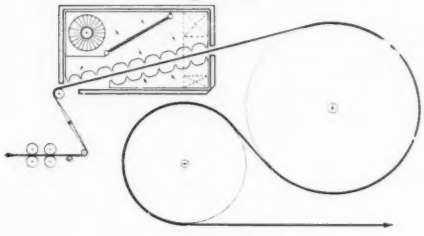


Figure 12

in these cylinders is large, there is good reason to look to a combination of air drying and cylinder drying to secure the desired result, both in quality characteristics and increased production. This prospect is accentuated by the development of a process whereby the size and lubricant are applied in succession rather than together, so that the lubricant is on the outside of the yarn. In this way air drying can be utilized in conjunction with the present cylinders to increase production per unit because sticking is lessened sufficiently to make higher speeds possible, while actually using less sizing and lubricating materials. Figures 11 and 12 show the dryer and a diagram of the method of installing it.

Acetates and other synthetic warps require such careful handling when wet, that to date, a series of warm cylinders is about the only practical equipment yet developed, and it is very difficult to predict the trend of future designs. However, it seems probable that these warps will be carried through the drying medium for the maximum distance between supports which their wet strength and the method of applying the drying medium will permit. Heated cylinders and stretching of synthetic yarn warps only make a more difficult job for the finisher and are likely to be completely discontinued.

Skeins placed in a modified form of the bucket used in the Stock Dryer already described show excellent experimental results, and it is more than probable that tomorrow's dryer will take a form wherein the skeins are dried in a horizontal position, fast and uniformly, where they are neither massed together nor hung so that the water can settle to the bottom.

Yarn in packages or beams is not suitably disposed for efficient or fast drying. Temperatures and humidity of air circulation must be regulated when drying yarn in this form to avoid taking water away from the surface of the package faster than the capillary attraction can carry it there. Dryers with regulated temperature, humidity, and circulation have done about the best with packages, and with beams high pressure air flow has thus far given about the best results. Tomorrow's dryers for these packages and beams really waits for a means of handling the yarn out of compact forms so that the drying medium can get at it or for a method of utilizing superheated water vapor under pressure for control of regain at delivery as well as change in length.

Chain warps will continue to be dried very successfully both on air dryers and heated cylinders, but the air dryer permits higher speed and has greater ability to handle synthetic yarns so it should gradually replace can drying.

Woven goods go through so many different operations, after or during which drying takes place, that tomorrow's dryer for this stage of manufacture offers many opportunities to reduce costs and accommodate the requirements of new dyes and finishes on new fibers and fabrics. In these dryers the cloth may be held firmly by moving chains, hung loosely over moving poles, laid on a horizontally or vertically moving apron, passed continuously over a succession of rolls, or carried on the drying medium itself. In many instances a combination of these is better than one alone. Tomorrow's dryers for textiles that are a flat web will continue to utilize these methods of conveying in such forms as will permit fast uniform drying from edge to edge and side against side. In all cases, except the moving bars, an efficient means of application of the drying medium will be utilized.

The tenter is the only machine for holding goods to definite dimensions while drying by the application of a gaseous drying medium. Practical considerations have usually limited its length to 90 feet. Tomorrow's dryers for cloth in tenter frames will not limit its speed, nor will old limits of practical mechanical operation govern the rate of chain travel. Therefore a determination of the most economical speed of operation should be made, and the results of such calculations for some fabrics and two dryer combinations follows.

Fig. 13 is calculated on the costs shown in Table I. It is based on running four yard goods either direct from the mangle to the tenter or through a pre-dryer located between the mangle and the tenter. These curves indicate a very definite speed at which the use of pre-drying begins to reduce the cost of framing and another definite speed for the point of maximum returns when using the tenter alone.

TABLE I

BASIC ASSUMPTIONS FOR COST CURVE

Overhead Items

Interest on investment—3 per cent.
Depreciation on building—3 per cent.
Depreciation on machinery—10 per cent.
Taxes not considered.

Labor Items

Operating hours, two shifts of 44 hours.
Labor (1 to 2½ men per range) 40 cents per hour.
Tenter chain repairs, $18.40 per 1,000,000 yds.

Power, including all range motors, .01 per KWH.
Steam (1½ lbs. per lb. water evap.) 0.40 per M lbs.

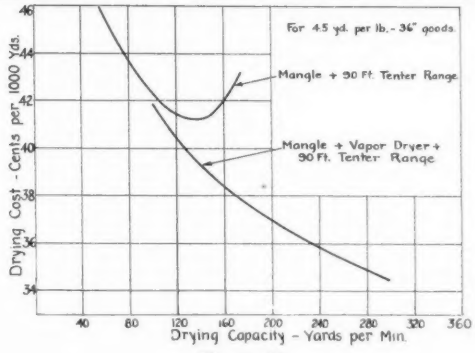


Figure 13

Fig. 14 is a curve of these most economical speeds for different weight goods. It seems unlikely that capacities in the tenter itself higher than 150 yards per minute on four-yard goods will be used except in cases where very heavy materials are to be handled or where a high degree of entering wetness is needed to obtain width. This is more likely now that the Vapor Dryer is available as a pre-dryer, for it obviates the necessity of range control and completely eliminates the damages caused by cans. Fig. 15 shows such a range.

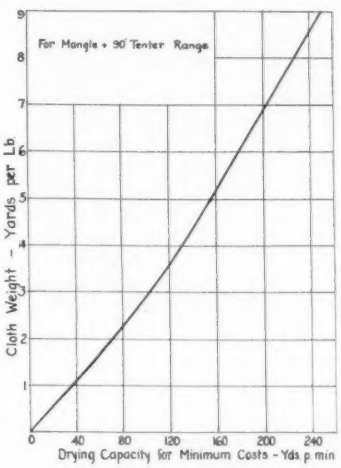


Figure 14

Figure 15

The accepted size of tenter frames for cotton and synthetic yarn goods determines the area of material available in the dryer to which the drying medium may be applied. The tenter range itself usually represents a relatively large investment with a large labor charge for its operation. Therefore, it demands a dryer which will give the highest possible transfer of heat per horsepower from drying medium to goods to secure maximum economical production or minimum cost per yard.

The invention of the nozzle shown in Fig. 16 made possible the accomplishment of high drying speeds on a tenter that are common practice today. These nozzles create their own complementary air stream for maintaining the initial temperature and velocity to and on the web of material being dried. Tomorrow's tenter dryer will continue to have these high capacities with the cloth accurately balanced between the top and bottom nozzles drying uniformly from selvage to selvage using the maximum of super-heated water vapor in the drying medium and without escape of heated air into the tenter room.

The dryer in which the cloth passes over rolls in a position to receive efficient delivery of the drying medium is shown in Figs. 17-20. Here the goods are under slight

Figure 16

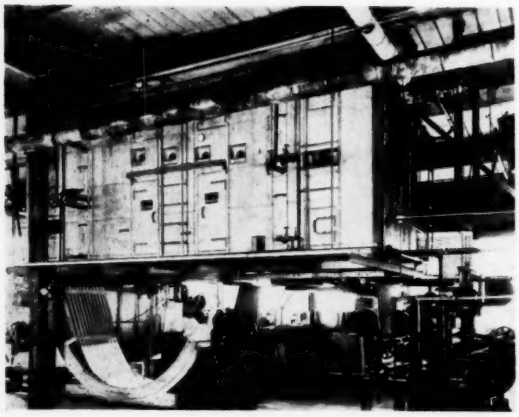


Figure 17

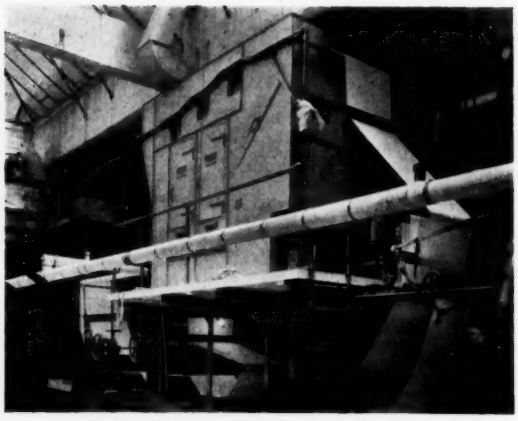
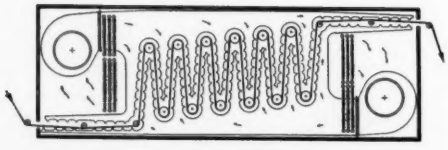
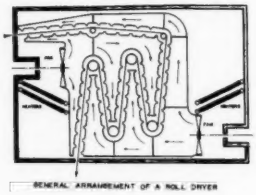


Figure 18



VAPOR DRYER

Figure 19

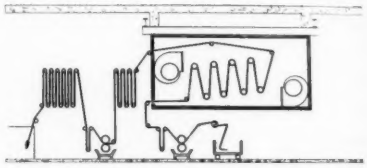


GENERAL ARRANGEMENT OF A ROLL DRYER

Figure 20

warp tension and the speed of the individual rolls is regulated by the cloth itself. The successful development of this type of dryer was also made possible by the invention of the nozzle, just mentioned, because of its extremely high heat transfer ability and high evaporation per square foot of exposed material per fan horsepower. It balances the fabric perfectly, and drying air flows to the return air passages without sliding the goods filling wise. This very fast drying requires a minimum of cloth in the dryer, few rolls, and practically no maintenance. Drying is so uniform that dyes, resins or other finishing materials do not migrate across or from side to side. Face matches back in color and handle.

The thermal efficiency of the Vapor Dryer is extremely high and it is adaptable without alteration to practically any fiber or fabric for any finish. It fits in, either on the floor or supported overhead as a separate unit, as predryer for tentering, an intermediate dryer between dyeing and developing Algosols and Naphthols, Fig. 21, drying



TYPICAL DYE RANGE

Figure 21

after high speed soapers or before curing, etc. It is tomorrow's dryer for all flat goods from sheer spun rayons to heavy blankets. Drying after the print machine is already tending toward a special thread-up of the Vapor Dryer, and it seems safe to assume that higher printing speeds and resin bonded colors will accelerate this tendency until the print machine can is entirely eliminated.

Although curing the type of synthetic resins most likely to be used for finishing is not entirely a drying operation, it is a heat transfer process insofar as the equipment is concerned. This calls for designs which are exactly parallel to dryer designs while the goods are being heated and a mechanism that keeps the cloth travelling while curing is completed. Where desired the drying and curing can be combined in a single unit. The Vapor Dryer's inherent features of design embody all of these requirements and its highly successful operation for this purpose promises its general adoption in a modified form for this work. Fig. 22

In many instances it is highly advantageous to carry on all or a part of the drying cycle while the fabric is com-

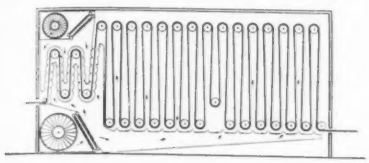
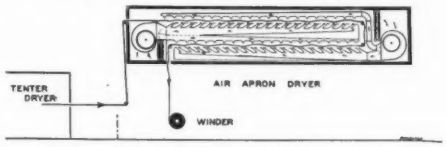


Figure 22

pletely relaxed both in warp or filling. Full true shrink in flat construction and maximum loft in crepes can be had in no other way. Fig. 23 shows the details of such a dryer wherein the goods are supported, propelled, and

Figure 23



guided by the drying medium itself without sacrifice of uniformity in drying. A survey of tomorrow's finishing plants will find this newly developed equipment operating as a separate unit and in conjunction with tenters or other machines. This figure also indicates the dryer operating in range with a tenter frame to secure full true shrink. The goods carefully wet out in a tension free equipment are fed into the tenter in the normal way and are partially dried there. The final phase of the drying, in which all of the drying shrink takes place, is completed in this true shrink dryer. Instead of being pressed while mechanically forced together, the fibers are really shrunk to their true shrink dimensions, and will withstand reasonable handling without gain in dimensions. Crepes of all types, goods made from all synthetic yarns or mixtures, whether flat or loft, heavy or light, pass through this dryer with equal facility, so there is good reason to believe that it will find a universal use where goods need drying in a relaxed state.

The dryer with the mechanical apron has found a place for itself, due more to its convenient method of receiving and delivering the goods, rather than to its drying efficiency, or its operating cost. Positioning of the fabric when the drying medium is applied evenly to both sides is very difficult. Delivering from one apron to another turns the cloth over, but migration of color or finish has usually taken place before the end of the first pass, whether multiple or single aprons are used either vertical or horizontal. Therefore there is good reason to believe that the air apron dryer will entirely replace mechanical aprons because of its simplicity, low maintenance cost, accuracy, versatility, efficiency, and uniformity of drying.

The dryer using forwardly moving bars, either still or rotating, will continue to have a definite place for those fabrics where neither uniform or fast drying is required and low first cost is of particular importance. They can be built long enough to give almost any capacity and plants making certain fabrics will probably continue to use dryers of this type for years to come.

When rate of drying controls the speed of an operation the dryer must be run at full capacity to keep the cost at a minimum. For this reason plants need to have a workable method of checking the actual capacity, as run at any particular time, against the rated capacity. Goods and conditions vary so much that there is seldom an opportunity to make comparisons by running some particular goods under the same conditions that prevailed when they were run previously. Therefore, there is need for some simplified calculation to reduce one set of drying conditions to a close approximation of some other.

The following method requires only two measurements, namely, the thickness of the cloth and the wetness of the goods entering the dryer. This last quantity is usually fairly constant for a particular equipment so that a good rough check can be made by measuring only the thickness of the cloth and the speed of travel through the dryer.

It is obvious that any dryer can deliver more dry material if that material has had more water removed from it before entering the dryer. Fig. 24 shows what this relationship of capacity to entering wetness is for an average of most materials handled by textile dryers.

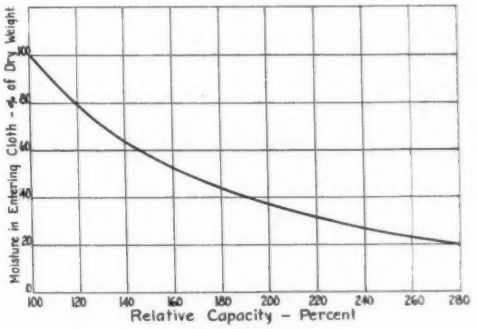


Figure 24

It is well known that some goods lose water in a dryer more rapidly than others. This variation is due to physical characteristics of construction in practically all cases rather than to any inherent differences in the fibers. The fibers themselves are so small in section that the moisture reaches the surface of them as rapidly as it can be removed until drying has progressed very nearly to air dry conditions.

Fig. 25 shows approximately the relationship between density and rate of drying averaged for the small variations of fiber and finish.

Temperatures must be varied somewhat for different fabrics, and different drying conditions cause variation of temperatures in dryers without temperature control. When these variations are large they should be recognized and a correction made for them. Fig. 26 gives the relationship between temperature and humidity and the rate of drying for average cotton goods. Other types and weights vary only a little from these quantities.

The laws governing vaporization and heat transfer are well known and accurately determined. They preclude the

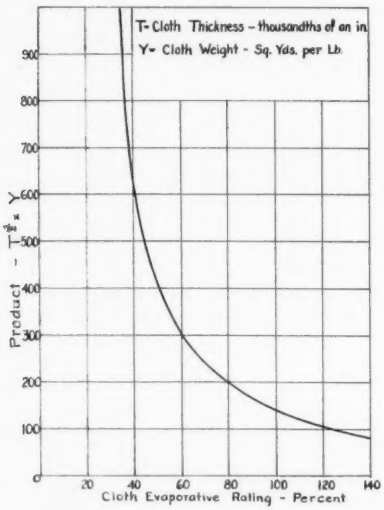


Figure 25

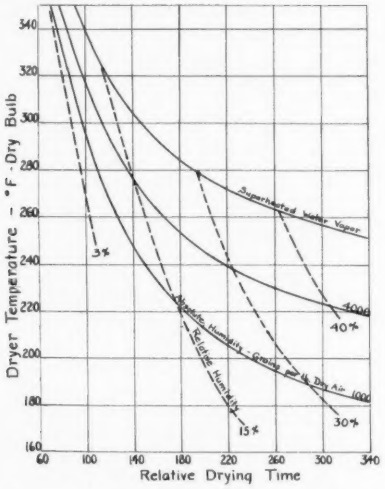


Figure 26

possibility of radical innovations in the drying process itself. Progress must come from painstaking developments of mechanism and equipment that utilize the product of research in things mechanical, electrical, and chemical. The textile colorist and chemist must point the way.

DISCUSSION

Q: Most of these air dryers are kept to a temperature to somewhere around 300° to 350° F. Is that about the average temperature?

A: I think the average temperature is nearer 300° F., because only a few plants have stepped up their steam pressure sufficiently to obtain 350° F.

Q: How much could you increase the speed of an Air Dryer like this, say, if you carried the temperature up to 400° F.?

A: Very little. The last slide showing rate of drying vs. temperature and humidity indicates that (Fig. 26).

Q: The possibilities of increased speed from higher temperature, if up to 1000° F. doesn't offer much,

A: That doesn't offer much because the problem is to supply heat to the material and inability to apply a sufficient weight of the drying medium to the goods would more than offset the small gain from temperatures. You would also of course have the hazard of a dryer too hot for the material being dried.

Q: Is there more opportunity to remove the water faster by increased circulation than from the use of a higher temperature?

A: Yes, by increased circulation and more material in the dryer. The Vapor Dryer is not limited in capacity. One that holds two hundred yards will dry twice as much as one with one hundred yards. Another big advantage is that a speed through these dryers of four or five hundred feet per minute is just as practical as fifty.

Q: The increase in speed would probably come from larger dryers?

A: Yes, larger dryers and more efficient drying rather than from excessive temperature. In newer dryers more than twice the heat is transferred per cubic foot of air handled than was possible with the older types and from six to twelve thousand feet per minute velocity of impact is maintained against the material. Raising the temperature would give its corresponding gain in drying only if you applied equal weight of drying medium against the materials at equal velocity. Equipment that could handle a drying medium at 1000 degrees and these velocities would be impractical to operate.

Q: I was interested in the dryer which you showed that carries the cloth along on the two air streams (Fig. 23). Is it carried along because of discharge of air at that angle?

A: Yes, sir.

Q: That actually takes most of the shrinkage out of the cotton?

A: It takes out all of the true shrinkage but not an amount equal to the loss by fulling in a modern laundry. True shrinkage might leave a residual shrinkage by laundering of from three-quarters of one per cent in mercerized broadcloths, to as high as two to three per cent in other fabrics. Such pre-shrinking makes it possible to sanforize at higher speeds.

Q: That offers some possibilities for high speed sanforizing?

A: Yes, goods which have been partially shrunk can be sanforized much faster.

Q: Are there any installations of that type in operation, in conjunction with sanforizing?

A: No.

Q: On the air type conveyor, is it difficult to thread up?

A: It threads itself.

Q: Have you any costs on using the vapor Dryer?

A: Yes, sir, the saving in steam consumption in almost every case more than pays for the power to drive the fans. It is possible to have a very high thermal efficiency.

Q: Are there any figures on it?

A: Yes, sir, but I haven't them here. Many tests of the

steam consumed per pound of water evaporated have been made.

Q: What did you say the average cost would be on four-yard sheeting, we will say, or what saving would you make on four-yard sheeting?

A: You make no operating saving in the sum of the cost of steam and power. You save steam, but increase the horse-power. It takes more power to drive the fans, than it does to drive the cans. The saving in steam would be offset by the cost of increased power.

Q: Is it any better as to production?

A: There is no limit to production. You can build them for any speed.

Q: What is the cost of production?

A: Are you talking about the first cost?

Q: Irrespective of first cost?

A: That doesn't change as far as the item called sum of steam and power is concerned.

Q: In other words, there wouldn't be any incentive for putting in air dryers, instead of cans?

A: Well, you have practically no maintenance cost, no ventilating system to maintain, no increased labor to obtain higher production, you save space in most cases and most important of all, damages due to stopping the range or from oil or can spots are entirely eliminated. In addition, the vapor dryer will handle all of the fabrics that cannot be placed on heated surfaces such as goods made from synthetic yarns or those treated with dyes or finishes that are similarly harmed by contact with heated metal.

Q: You mentioned shrink for sanforizing?

A: Yes, sir.

Q: What are the prospects of that? Do you mind repeating that?

A: In the first place, the fabric which has a potential shrinkage of one inch per yard would probably be given a better finish on a Sanforizer than one that has a potential shrinkage of three inches. That is, the Air Apron Dryer partially shrinks the goods before entering the Sanforizing Dryer and makes possible, a better finishing job. Secondly, the Sanforizing machine can be operated at higher yards per minute when removing from the goods a potential shrinkage of one-half inch, than when removing three inches or four inches. Therefore if the finishing operation carried on prior to sanforizing gives the true shrinkage, the expense of sanforizing is reduced. The prior operation is not made more expensive so the total expense from mangle to folder is less, because the starching operation is handled to get the true shrink.

Q: Will you make an estimate of what gain in sanforizing speed you might get?

A: No, sir, I cannot tell you, but some fabrics that require two runs through the sanforizer can be handled in a single run.

Q: Do you have installation of air dryers on wide sheeting?

A: No, sir, it is going to take quite a while, perhaps eighteen months, to finish developing one, and we do not usually offer any machine until it has two years' successful operation in some one plant.

Resins—

(Concluded from page P519)

applied as a waterproofing agent to garments?

Dr. Powers: The type of application we are referring to here doesn't cut down your moisture absorption. Of course, if you coat with the resin you will waterproof. If you put a continuous film completely over each fiber, you will change the character of your fabric appreciably before you get a good waterproofing. Primarily, the problem we are working on here is to put them on the fabric without making it waterproof. By keeping the fabric absorbent we make it handle and finish like an ordinary fabric. Fabrics are being waterproofed with resin, and improvements have been developed recently for that effect.

Dr. Harold: Is there any possibility of treating and dyeing afterwards? Are all these resin treatments resistant to dyeing?

Dr. Powers: They should be. You certainly can apply resins that are resistant to dyeing. On the other hand, the tendency is not to, since the dyer has enough headaches without giving him another one. If the resins are not evenly applied then the dyeing is uneven. Resins can be applied before dyeing and it has been done. But normally it is not the simplest and most satisfactory way to do it.

Dr. Harold: It often happens that you treat your pile and don't treat your back, and may want to dye after that.

Dr. Powers: That is being done today. There are others here who know a great deal more about it.

Dry Cleaning—

(Continued from page P529)

who is responsible for a great deal of the engineering work on this machine, and his advice has been an enormous amount of help to us. I am sure if you have any definite solvent problems which you care to ask that I can't answer, Mr. Hamilton will fill the bill very nicely.

Mr. Bartlett: I would like to ask if you use any particular chalk in marking for the burling and sewing?

Mr. Derby: Well, we didn't experience any difficulty with the type of chalk which we were using at the mill (ordinary mill crayon). We processed some goods, very recently, for one of the other mills up there, and they marked that piece of goods as an experiment with at least ten different kinds of chalk; and out of the ten different kinds of chalk there were only three which did not come out entirely. Those three didn't come out at all. They were just the same as when they went in there. I believe they were grease chalks. Most chalk will come out, but as I said, some chalk is absolutely impervious to the

machine. Some grease chalk seems to come out very satisfactorily.

Mr. Borghetty: Was the figure of .05 an average, or was that just a particular case of a light piece of cloth, or is that what you would expect normally?

Mr. Derby: No, that is lower than we would ordinarily expect. It is a light piece of cloth, but ordinarily our petroleum ether extractions on that type of material will be in the neighborhood of .9 to 1 per cent.

DISCUSSION

Northern New England Section Meeting

Q. At what temperature do you use your solvent?

A. As cold as possible, it is very efficient when used cold.

Q. How much solvent do you use?

A. That can be answered best by saying it costs $.005 per pound of material processed. We may be able to get down to $.0025 per pound with the new machine. It is impossible to recover 100 per cent of the solvent.

Q. How does the cost of cleaning with this machine compare with soap and soda?

A. Soap and soda is cheaper because it also felts but will not remove tar or paint.

Q. How do you get over the chalk marks?

A. Any chalk that we use comes out. It is not soluble, but is taken out mechanically.

Q. Do you find the wool more brittle after it is run through the dry cleaning machine?

A. No, we have found it to be the same.

Q. What is the cost of the machine?

A. The cost of the machine cannot be stated. It is made by the Riggs & Lombard Company. Future development will determine its cost but it will be about the same as a good carbonizer.

Q. Would you have any residue of solvent in the cloth?

A. There is none if the cloth is dried properly.

Q. What recovery of solvent do you get?

A. Approximately 96 per cent, but we should get 98 per cent.

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Greetings

to the

Members and Guests

of the

American Association of Textile Chemists and Colorists

at the

Nineteenth Annual Meeting
September 15 and 16—Boston, Mass.

THE TEXTILE REVOLUTION
Are Others on the Way?

HISTORY may be just "old stuff." However, it has a way of repeating itself, although it may be in a new form. Man differs from other animals in that he is supposed to learn something from history.

About two hundred years ago the so-called Industrial Revolution began in England. It was the beginning of the present day factory system. It might well have been called the Textile Revolution or even the Cotton Revolution because the most significant events concerned the manufacture of cotton.

During the hundred years or so of this Textile Revolution, cotton displaced wool as the paramount fiber in Europe, took the place of a large amount of flax, and came into use to a far greater extent than either of its predecessors.

The fine cotton goods industry of the East became largely transferred to Europe, although now it is drifting back to Eastern countries.

The rise of a "new" fiber and the shifting of a great industry came about through a series of related but uncoordinated events in England. When Kay snapped his first fly shuttle through a warp in 1733 he showed how to make one loom produce two to four times as much cloth as one could make in a given time before. The weavers were up in arms. He would throw half of them out of work. They smashed the improved looms but that did not prevent progress. They, of course, overlooked the facts that the best weavers would continue as weavers and have a better business; and that there would be a much greater demand for yarn and, therefore, for spinners. No doubt male weavers did not like to run the "spinsters'" hand wheels. There was dislocation and need for adjstment but the overall result was an advance in the textile business, at that time entirely a home industry.

The new and acute need for more and better yarn set many men to thinking about more-mechanical ways of spinning. There were a few real ideas such as the drafting rollers of Lewis Paul and John Wyatt in 1838, but no complete device for rapid and satisfactory spinning until Hargreaves' jenny in 1770. A hand-driven machine could spin up to twenty ends from roving.

This machine threatened the spinners who could not or would not obtain it, and again they retaliated by smashing all they could get their hands on. However, the loom was ready for the machine spinner and there was apparently a demand or potential demand for all the yarn that could be spun for a long time to come. Again adjustments of personnel were needed but the machine tended to make more work rather than less.

In 1769 Arkwright came along with his water frame and a few years later Compton brought out the mule. The mule was the most complete and successful of the mechanical spinning machines. It not only made quantities of yarn but spun very fine counts. It made the first cotton yarn that could be used extensively in England for fine warps. (Linen had been used for most goods up to this time.)

The hand spinners tried to retard mechanical spinning and made efforts to limit the jennies to such numbers of spindles as could be turned by hand. They went about smashing all the machines they could get hold of in some localities but, again, that did not stop progress.

The mule made yarn which could compete with the fine hand spun yarns of India, and soon England became the fine goods center of the world.

Arkwright made the water frame but his great contribution was the complete organized cotton mill. Textile machinery had been run to some extent up to this time by water power or by horses or oxen turning revolving capstans. Arkwright improved available machines, added his own, and put them all in one plant driven by power—steam when engines became available.

The neighborhood textile workers were scared at such great developments and burned at least one of Arkwright's large mills. However, he had made enough money to continue on his way from itinerant barber to first master cotton spinner of the world.

Then came Cartwright's power loom, improved and modified by subsequent inventors but not widely adopted in truly successful form until little more than a hundred years ago.

The social upheavals when the cotton mills began to forge ahead made the machine smashing riots seem like petty local events. A fairly prosperous middle class of small textile workers was destroyed. Men were thrown out of work. Women and children were forced into mills at small pay and unbelievably long hours in order to live. A large part of the population moved from the country into city slums.

Such results were unforeseen, unexpected consequences of unexpected industrial changes. The problem was on them before they knew it but the English government responded with factory acts and some of the earliest constructive social legislation.

On the other hand the new business made unusual opportunities for individuals to better themselves, and led to large enterprises in financing and commerce. Yarn and cloth became cheaper and more available and a book of the time, *The Results of Machinery,* said "Two centuries ago not one person in a thousand wore stockings, now not one person in a thousand is without them." It required nearly a hundred years for the real machine development to take place.

There have been somewhat similar broad and long-time trends in our own country in recent years. Cotton manufacturing has tended to transfer from New England and to expand in the South. The reasons are familiar and too involved for this discussion. The overall result has been a general improvement in one section of the country, with periods of unemployment and hardship in other districts until adjustments were made.

There is also now a tendency for cotton growing to increase in foreign cotton areas and to diminish in our South. The loss of export business to the tune of perhaps 3,000,000 bales a year has been attributed to devices to keep prices high as compared with world prices; and to high tariffs which prevent payment for cotton by Germany and some other countries with manufactured goods.

Another school of thought, however, contends that foreign cotton production has been increasing for many years, and that much of the loss of our export business would have occurred in the natural course of events.

Whatever the cause, we used to export 60 per cent of our cotton and use 40 per cent. Now our exports are nearer 40 per cent and we cannot use up the remaining 60 per cent. At present the difference is part of an immense carry-over.

Are we coming to a place where we will raise only half of our present crop, that is, not much more than we can consume here? What will happen then to a million or so cotton farmers and the other workers who now depend on this cotton for a living?

No one seems to know the answer but the problem is recognized. So far the remedies, except for their emergency value, seem to be as bad as the ills that they would cure. We had the bumper crop of all time just when the effort was to keep crops down in order to help prices. We have the largest surplus in history and the smallest export market of any comparatively normal years. There are warehouses full of cotton representing far more cash outlay than can ever be returned by it.

Since cotton dominates the affairs of the South this great textile problem affects not merely cotton mills but every large enterprise in this country which has goods or services to sell.

From the sidelines we are inclined to think that the problem is not being handled well but can the ramifications of such a problem be sufficiently visualized by politicians, statesmen, sociologists, scientists, economists or any one else, separately or all together, for anything like a fair and complete solution?

Just for example, Germany claims that our price adjustments and tariff restrictions prevent her from buying cotton here to the normal extent. Instead she barters with Brazil for certain amounts, and thus we (so it is claimed) encourage Brazil to grow more cotton and to become a stronger competitor. The industrial sections of this country do not want tariffs lowered so that cotton can be bought with manufactured goods any more than the South itself would want cotton paid for with Japanese cotton piece goods.

In addition, with Germany and Italy it is not merely a case of buying cotton elsewhere than in the United States. For reasons of their own they are trying to exploit all kinds of sources of possible synthetic fibers. However, as far as this is a function of American cotton prices, here again we are fostering some new kind of competitor by attempts at price maintenance.

Thus we have something that may turn out to be a revolutionary change in the American cotton textile economy. But, it is also contended that if about half as many farmers raise about twice as much cotton to the acre, and really cut costs of production, the loss of the foreign market can, perhaps, be forestalled. Then the problem will be to find other crops or employment for the displaced cotton farmers and their help.

Whether the market for half the cotton is lost or whether the whole amount of cotton is raised by half the people, the result will be much the same—several million people

dependent upon cotton farming will have to find some new means of existence.

In addition to this major problem which is already wtih us, is that of the increasing use of many kinds of synthetic fibers. This part of the problem is developing particularly in several European countries. We know well enough, in spite of optimistic statements that Ersatz fibers are not any too good for many of their uses. Small or moderate amounts can be mixed with cotton without any too serious effect, but 100 per cent substitute is usually a different matter.

Many "synthetics" have been tried and many more ideas will be tried, but so far the bulk is either filament or spun rayon, already approaching 10 per cent of cotton consumption, with staple replacing about a million bales of cotton in Germany alone.

With all the research, present and prospective, we must not be too surprised if a real competitor for cotton is found—a man-made fiber, fine, cheap and strong, and free from hazards of the weather and major fluctuations of the market, or a modified natural fiber like cottonized flax or hemp.

At various times new natural fibers have been promoted as cotton substitutes but none has ever given much hope of success and there seems to be little to fear from this source. Such a fiber, *if successful,* could probably be grown here, too. At least, it would probably not be imported. There is very slight chance of such a fiber being found but the search is still on and a long, clean strong fiber obtained from the broom plant is being tried in Italy to replace jute, cotton and flax.

Cottonized fibers have attained a degree of success abroad after many years of experiment. In some instances their use is compulsory as in Poland where a certain admixture is required with cotton. Such fibers may become a real factor in reducing cotton consumption in foreign countries. They are not likely to be imported here beyond use for novelty fabrics.

There is almost continuous study in this country on raising flax and hemp and working them up by unusual methods such as cottonizing. It is an attractive subject which has not yet had any great commercial success here. In general, the fineness of yarns is limited and the economics of the projects are not yet favorable. There is no large immediate development in prospect.

A partial change from cotton to something else which could be grown in the same areas might have advantages. If on the other hand, there were some foreign synthetic fiber with outstanding merit as a substitute for cotton it would soon find its way over here, and would be manufactured here.

So far synthetics have lacked the strength for the more severe requirements, or at least wet strength. Now, however, three or four kinds of very strong fibers are coming out. They will be much above the price class of cotton but they will apparently have real character. And—Well! rayon used to cost a whole lot more than it does now and it was not nearly as good. There seems to be nothing to prevent some more history happening again, in the development of low priced good fiber.

Will the present forces tend to eliminate the half of the American cotton crop that is exported? Will other fibers, perhaps not yet in use, tend to eliminate the other half, that is now used at home?

Naturally we do not think so. Neither did "experts" think rayon had much of a future when it first began to get its camel head past the tent flap.

As with every business venture in a free economy the "fittest" fibers will survive. Each fiber will find its proper uses and we who are interested especially in cotton do not want to miss any new uses through not looking. Research must have its place, probably a much greater place in the cotton industry than heretofore. Fuller E. Callaway recently proposed a $25,000,000 annual expenditure.

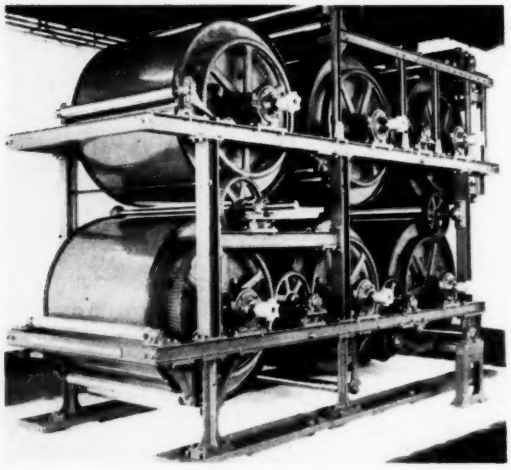
It is also apropos to ask, if synthetics crowd out cotton how many good customers will they eliminate at the same time? If thousands of people now in some branch of the cotton business are thrown out of employment there will of course, be other thousands required to make new machinery and the new fibers. However, between the encroachments of synthetics and the loss of outside markets there may be about as serious adjustments required in the near future as in the original Textile Revolution.

The most important possible contribution to this whole series of problems would be for some competent body to watch all research and commercial developments here and abroad, in the raising of cotton and the manufacture of its competitors, in order to formulate the resulting problems as they may appear. If they can be foreseen far enough in advance they can perhaps be forestalled, their effects minimized, or suitable adjustments made—unless such broad deep movements as are now under way are found to be beyond all planning—CHARLES F. GOLDTHWAIT.

Complete Reports
of all
Papers and Discussions
at the
Nineteenth
Annual Meeting
AATCC
will appear in future issues

Textile Printing—

(Continued from page 494)



Photo, Courtesy, Textile-Finishing Machinery Co.

Figure 4

use of the new daylight fluorescent tubes. This new lamp is 35 per cent efficient, as compared with 8 per cent efficiency of the ordinary Mazda bulb. Or, looking at it another way, it gives three times as much light per watt of current consumed, and more important still, gives daylight, so that the printer, back-tender, ager, dyer, or color-mixer can more readily judge the actual shade of the colors.

Another attachment recently developed is a new type of furnisher-roll, which the inventor calls "Gearless," or self-driving, in that no mandrel or furnisher-gears are necessary. The roll, which is rubber-covered, is driven directly through contact of its shoulders with the copper print roll. It is said to furnish beautifully and saves all the time previously used by printers in looking around the shop for the proper size mandrel and furnisher-gears. All that is necessary to do is to drop it in the color-box and push up the color-box until the roll is in contact.

With regard to the printing machine itself, minor changes in details in many instances in individual print-works have accomplished higher speeds and production. In one print works, we have been told that they have abolished lapping, blanket, and back gray, and are printing directly on a rubber-covered drum at a speed higher than heretofore known, but so far as our information goes, the colors used are of the lacquer type and the guiding onto the cylinder is controlled by a special form of apparatus in the back of the machine, the alignment being taken care of by an electric eye. The engraving on the rollers is the exact width of the goods, therefore it will be seen that perfect alignment is absolutely necessary in order to obviate staining of the rubber covering on the drum.

Figures 6 and 7 illustrate a brand-new ultra-modern printing machine. While this machine is not operating as yet in the textile industries strictly speaking, it is possible that it may be doing so in a very short time, as one important printer has expressed the intention of installing such a machine very shortly. Over a dozen of these machines have been built and are in operation, printing paper, cellophane, and coated goods.

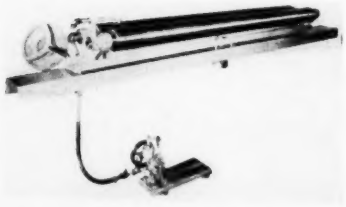
The two photographs show a back and front view of the same machine. Figure 6 shows two Intaglio printing nips with enclosed color pan and a dryer in between. This is for use in printing lacquer colors. The machine is provided with enclosed bottle-feed for the colors, pneumatic doctor driving-heads and chain-dryers. Fig. 7 shows three surface printing nips, making use of the sieve-cloth, or felt-blanket method, of feeding ordinary color to the surface printing rolls. Thus this machine is equipped to produce two different kinds of printing and with two different types of colors.

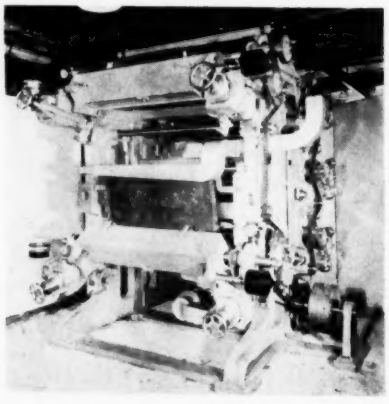
Figure 7 also illustrates the levers on the side of the machine, by which pressure may be backed off all nips simultaneously without losing registration of the pattern.

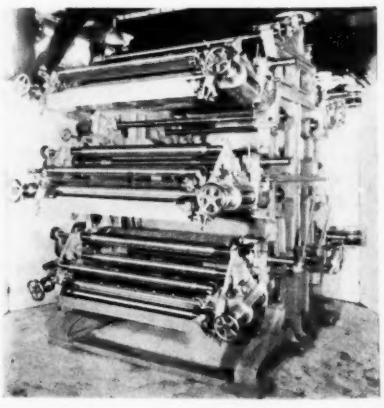
It is stated that this machine provides the following advantages: does intaglio, surface, duplex or intermittent printing or a combination thereof, thus making new novel patterns possible; better penetration at the present speeds or normal penetration at higher speeds, with intaglio nips; "hand blocked" or "hand screened"

Photos, Figures 6 and 7, Courtesy, John Waldron Corp.

BELOW—Figure 5
RIGHT—Figure 6
FAR RIGHT—Figure 7

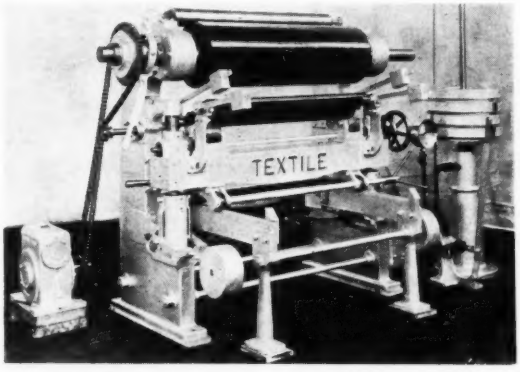






effects and eliminates doctor blades, with surface nips; prints multicolor "lacquer prints" and dries between nips thus securing possible embossed effects; exhausts lacquer fumes; can use paper "back greys"; as it is a sectional machine a two color unit may be added to later; it is possible to "fit" while running at speed; saves color through use of small adjustable color pans inside of outer pan; assures simplified and smooth doctor motion and eliminates chatter (air driven doctors) and is constructed to include an automatic blanket guide; handles easier and change over between patterns and combinations is quicker (due partially to instantaneous pressure release); will fit accurately (because of small pitch gears); will run quietly and without vibration (due to elimination of heavy central cylinder and inclusion of sprocket chain drive).

Another textile machinery manufacturer is coming out with a new printing machine embodying a great many novel mechanical features, designed to turn out goods in much greater volume and at lower costs than have hitherto been possible. We understand that the first machine is now building and will be in operation before very long, and as soon as particulars are available this will be made the subject of another article. However, details are not available to include at this time.



Photo, Courtesy, Textile-Finishing Machinery Co.

Figure 8

A new printing blanket introduced within the last two years has attracted quite a little attention. It is said that this blanket, which is used in conjunction with a washing apparatus, can be run at higher speeds than the ordinary print blanket and without the use of back greys, thus saving the damages resulting from seams in the back greys and also the time lost in changing the same. It is of endless construction, eliminating the misprint splice, which is a common defect of some blankets, and the maker claims that it has a longer life than most blankets on the market, and that it gives complete satisfaction when working with lacquer colors. The surface of this blanket is said to repel colors to an unusual degree, and therefore reduces the building up of color and consequent frequency of necessary cleaning of the surface. The claim is also made that it is less severe in its damage to the lapping than the usual blankets used in the trade.

A new engraving, proving, and sampling machine for testing the engraving on copper printing shells has been recently put on the market. It has for its purpose the quick and simple mounting of printing shells for testing purposes, previous to placing them in commercial production without tying up a standard printing machine. It is provided with hydraulic pressure, and the machine is so designed that the copper shells may be mounted and moved to and from the working position with easy access to the printing-machine cylinder and doctor blades. This machine can also be used for making samples or trying out colors before sending them to the printing machine. (Figure 8.)

(To be continued)

Yarn and Fabric Trends—

(Continued from page 500)

there are a number of new products in viscose and acetate yarn and staple fiber. We might list the products and give their characteristics, but they each have some particular reason for being, and it probably will be clearer to study first the characteristics which are desired. Here you will need to use your discrimination, for there is more loose talk and ballyhoo on the seemingly scientific subject of characteristics than any other phase of rayon. In fact, like human characteristics, they frequently are the subject of just plain gossip.

Strength

Viscose yarn is stronger than acetate yarn and both are stronger than spun yarn made from the respective staple fibers. While the dry strength of both types of yarn in both processes is satisfactory for most wearing apparel and house furnishings, there are some quite broad textile fields where greater tensile strength of rayon will permit its wider use. For this reason there has been developed in this country two makes of strong viscose yarn for automobile tires. Not only is superior tensile strength inherent in these yarns, but rayon yarn causes less internal heat than cotton and allows the rubber a longer life on the tire. This rayon is specially prepared for the tire industry and as such is not suitable for the usual apparel uses of rayon.

Another strong viscose yarn is produced for general textile purposes where tensile strength and abrasive resistance are required. In coarser fabrics it is used in linings, particularly for fur and other heavy overcoats; for sports clothes, ski shirts, football pants, basketball trunks; for shirtings, alone or with spun rayon; and suiting materials in combination with spun rayon. In lighter fabrics it is used in full fashioned hosiery, sheer woven dress goods, flat knitted materials, and lace. It also has a number of industrial and other textile uses where strength is important.

In England there has been developed recently a stronger

acetate rayon yarn, which is even stronger than viscose. This yarn will be made in a new plant here according to announcements. This type is not to be confused with other new synthetic yarns of non-cellulose types.

In spun rayon strength is important in the cotton industry because of the fact that it is not as strong as filament rayon in the first place nor as cotton in the second. Here wet strength is important, for many spun rayon fabrics will show a dry fabric strength equal to cotton fabric but need additional wet strength to withstand laundering. To meet this demand a stronger viscose staple fiber has been developed in England which is finding increasing uses here.

Strength of spun rayon is a different proposition from strength of filament rayon. It is dependent on inherent tensile strength of fiber, fineness of fiber, length of staple, staple dispersion, cleanliness and freedom from nep, evenness of spinning, yarn count, twist, humidity, and conditions of break test. It is therefore impractical to say in general that the stronger staple gives a certain percentage increase of strength over the standard. The percentage increase is greater in the coarse counts. In the finer counts as many as possible of the factors giving added strength should be employed so as to gain the maximum benefit from the material.

One of the difficulties with the second phase in Germany is that in their eagerness to show increased strength, figures are quoted which are not always borne out in practice. At the Leipzig Fair some claims were made which have not yet been verified by results in yarn.

In the worsted *industry* strength of rayon staple is of no particular interest, for the manufacturer realizes that he is dealing with a fiber already over twice as strong as wool. In the worsted *trade,* however, strength seems to be everything, judging by the practice of trying to damn rayon blends through wetting fabric and breaking it. A considerable amount of misinformation has been passed around the woolen trade by such methods and even though the manufacturers know better, many parties handling worsted clothing have the impression that a suit of rayon blend will open up in a rain or part at the seams if the wearer works up a perspiration. It is amazing how deeply impressed this picture has become in the minds of supposedly experienced textile men, and yet it doesn't prove out either in theory or practice. Here is a challenge for those of you who may be working with worsteds. Make some scientific comparative tests on strength and wearing qualities between all worsted and worsted blended with a known brand of rayon staple fiber in the same construction and see for yourself. You need not take it on anyone's word.

Resilience

What wool does have to a greater degree than rayon is resilience. In woolen or worsted fabrics one requires a certain character of hand, a springy, lofty, clothy feel. This character has been attributed variously to crimp, curl, elasticity, static, and specific gravity. They may all contribute, but probably the most important factor is resilience. That is the quality which makes a fiber spring back to its former position when bent to one side and released. Wool fibers are twisted out of their natural shape in spinning and their resilience keeps straining to get them back into their original shape again. The fibers in the yarn are lively in somewhat the same sense as a crepe twisted yarn is lively. In the same sense that a brass spring has more resilience than an iron spring, so does wool have more resilience than rayon.

Crimp

Efforts have been made to meet this requirement by giving rayon an artificial crimp. The word "crimp" needs some defining, as it is being loosely used in the trade and has become almost more of a slogan for a crusade than a term defining a fiber. The dictionary defines the verb crimp as "to bend or press into ridges or folds; corrugate; flute." And the noun as "anything crimped, as a lock of hair." There is a crimped viscose staple on the American market. There is an acetate staple which is commonly referred to as crimped but which is practically straight and with considerably less crimp than standard viscose staple fiber. If crimp is what one really wants one must not be misled by the use of the term in the trade.

The permanence of a crimp in staple fiber is important. There obviously is little use in going to the trouble of putting a marcel wave into a fiber just to make it look, in raw stock, like wool, if the wave will be drawn out in the normal processing and spinning of the fiber into yarn and weaving into cloth. If the crimp disappears and does not return when the fiber is wet out and dried, or if the crimp can be ironed out between thumb and forefinger there is little chance of its surviving through to the ordinary fabric. It might have a place in some fabric like plush or pile constructions for appearance, but its use there should not be confused with resilience.

Chemical distortion of the surface or shape of the fiber is employed to produce crimp. If it fails to produce crimp it still might lend a wooly character to the fiber which is desirable. The so-called hollow filament fiber is in this class. It is not crimped but the fiber is inflated and the distortion of surface gives a distinctive hand. At the same time it has reduced strength and so is not used generally.

A viscose fiber of the wooly type is being made in England and is being introduced here. It is not crimped but it has a more wooly character than ordinary viscose. It is of interest in wool blends or for straight spinning in dress goods, hosiery, underwear, blankets, and suitings.

Another method of making a wooly type of fiber is by adding casein to the viscose. Such fiber is on the market in Italy and has the added feature of giving a two-tone dye effect with regular viscose.

Some resilience and wool-like character is given viscose fiber by synthetic resin treatment. This is a whole field in itself, and there are so many types and degrees of treatment that we will not attempt to do more than

recognize it here as a decided trend. Treatment of fiber itself has not been adopted to any extent, but treatment of yarn is practical, and treatment of cloth is quite general commercial practice. It is employed much more widely in England than here, even though the finishing prices there are equivalent to ours here. They seem to recognize the merits of the treatment more than does our trade, and they are willing to pay for it. At least half the spun rayons are given a resin finish in England, while here it probably is not over five per cent.

Specific Gravity

Acetate has almost the specific gravity of wool and so in this respect is more suitable for blending with wool than viscose. This feature and the cross-dye effect seem to be sufficient to overcome the higher price of acetate staple as compared to viscose. The specific gravity plays an important part in the hand of a fabric. In wool there will be more bulk for a given weight than in viscose. Therefore one must compare microns as well as denier and grade to gain a true comparison of wool and rayon. To get the same bulk as wool one would use a heavier denier than the equivalent weight of the wool fiber.

It is probably on this basis that the American worsted trade has standardized on 5.5 denier while all of Europe uses 4.5 denier instead. In Yorkshire they choose their denier more for reasons of economy than an attempt to duplicate the size or weight of the wool fiber. Therefore the trend is toward even finer sizes instead of increasing to match American practice. In Yorkshire where there is less differential between the price of wool and rayon staple than in this country a fine size of rayon is blended with a coarse grade of wool and a finer yarn is spun than would be possible with that grade of wool alone. This thought has led to a decided trend toward the use of 3 denier in worsted blends, something which is practically unheard of here in the worsted industry.

Abraded Yarn

The efforts in spun rayon to give new wool effects have brought out efforts to make filament rayon more like spun. A virtual cross between the two has resulted in the abraided filament yarn. A filament rayon yarn is run over a rough surface and some of the filaments are snagged and broken. Thus by doing deliberately what the rayon producer has for years tried to prevent a new product is introduced which gives a fabric with some character of both the filament and the spun yarn fabrics. The abraded yarns are made in this country both in viscose and in acetate.

Flat Filaments

Artificial straw, or visca, has been on the market for years. As it gives a glint to braids and millinery and in drapery fabrics it was thought that an attractive glint to dress goods might be captured by making fine straw or flat filaments instead of the usual type. This resulted in the production of a line of acetate flat filament yarns which give a novel effect.

Thick and thin continuous filament yarn is another fairly recent innovation which produces a shantung effect and is similar in some degree to certain slub types in spun rayon.

In Lancashire spun rayon slubs are being made in twenty-eight inch lengths with only an inch or so between the slubs. It makes almost a pique, or bengaline type of cloth. The same mill has a slub attachment on mule spinning with a repeat about once a week. This almost complete lack of pattern is of interest in using both thick and thin yarn and slub spun rayon.

Spun-Dyed Staple

The cost problem of stock or top dyeing rayon in fast colors for wool blends brought about the production of a range of half a dozen colors in spun-dyed staple in England which is also available in this country. While it originated for worsted practice the Lancashire mills have taken it up and have found it quite economical in cotton practice. Fast colors can be spun into yarn at prices much less than is possible with fast stock-dyed material. The spun-dyed colors are fast to everything as the color is all through the fiber and a part of it.

The use of either stock-dyed or spun-dyed staple is more prevalent in Lancashire than here. Beautiful heather mixtures for fall are being made there this spring by blending colored fiber. The blends are being made at the drawing frame, where the effect is controlled by the arrangement of colored sliver. A different order of the colors changes the shade of the resulting yarn. Three denier white is blended with 1.5 denier colors to go to the outside and gives a smoky tone to the fabric. The effect is particularly pleasing as it gets away from any garish contrast of color and makes a fine blend. In blending one color and white to make a shade it is common practice in Lancashire to comb the material to insure even blending and to avoid mottled patches of color or white.

Wool-Dyeing Staple

There has been a demand for a staple that would take wool dyes ever since rayon and wool have been blended. In some fabrics a union between wool and rayon is required in the same bath for economy's sake. In others a two-tone effect is desirable, as in piece dyeing or striped suitings. In another type it is desirable to replace wool with a rayon which will give a two-tone dye with viscose.

Casein fiber, which is being produced in England and in several continental countries, takes wool dyes and is being used for union dyeing. Casein and viscose compound fibers, such as Cisalfa and Railan being produced in Italy, and others in Germany, give a two-tone effect. In England, a viscose fiber known as Rayolanda has been developed, which takes wool dyes and viscose dyes, and which is particularly suitable for two-tone effects in piece dyeing.

An outstanding development for fall in England and here is a heather mixture made by piece dyeing fabric woven of yarn in which three or four different fibers are blended. Bright and dull viscose staple compose the

majority and acetate and wool the balance. Three colors and a second tone of the ground color are produced in the finished fabric. It is established here in several lines on the current market and promises to be one of the standard fabrics of the season.

For this reason we have decided to give the fabric a name, in accordance with the plan outlined in my address of January 20, 1939, before the National Retail Dry Goods Association. The name chosen to cover these three or four fiber blends in plain yarns and weaves is the word "Trossach." The Trossachs, as you know, is a small section of country in Scotland west of Edinburgh. The word is from the Gaelic meaning bristly, which is not out of keeping with the tweedy character of the cloth. The country, only a little over two miles in extent, is of heather and bracken covered hills of olive, purple, and brown, with yellow broom and gorse in the valleys, and of blue lakes and sky. It is the country of Rob Roy and of the Lady of the Lake, and the colors of the fabric convey the atmosphere of the country. The name is being registered through the National Federation of Textiles, Registration Department, and will be available to the trade for use as a generic name for this type of fabric.

With this example to start the plan in actual operation, I hope to see the rest of you add generic names to the list as fundamental fabrics are created.

I will now turn the meeting back to you with appreciation for this oportunity to wander through your technical field.

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Silk and Silk Processing—

(Continued from page 502)

fiber was 14.02 microns before degumming and 11.88 microns after the sericin was removed from which it was calculated that the silk fiber lost 22 per cent of its area during degumming. The swelling of sericin appeared to be independent of the original diameter and amounted to an average of 230 per cent on a diameter basis.

Internal Structure of Fibroin

A Japanese investigator has studied the effects of the orientation of micelles upon various properties of four fibroin fibers. The ratio (D) of the number of oriented micelles to the total number of micelles was determined and correlated with the dry and wet breaking strengths of the fibers designated as F and f, respectively. The following equations were developed:

$$(1)\quad F = 2.9 \times 10^6\ D$$
$$(2)\quad f = 1.3 \times 10^6\ D^2$$

The breaking strengths were measured with Schöpper's testing machine and expressed in terms of 10^6 grams per square centimeter. An assumption was made that the breaking down of the fiber occurred after all the micelles had been turned in the direction of the axis, and this appeared to be substantiated by the fact that the per cent elongation calculated on this basis agreed very closely with the actual per cent elongation of the wet fibers on the above machine.

The Chemistry of Sericin

The two types of sericin, known as Sericin A and Sericin B, have continued to be studied in Japan. The two sericin fractions were separated as usual by adjusting the pH of an aqueous solution of sericin to about 4.0 and thus obtaining a precipitation of Sericin B. Sericin A was precipitated from the filtrate by the addition of alcohol. The nitrogen distribution in each type of sericin was determined and is shown in the following table:

Type of Nitrogen	*Sericin A*	*Sericin B*
Amide	12.14	10.22
Humin	0.17	0.90
Cystine	0.00	0.00
Arginine	9.15	9.68
Lysine	4.70	4.72
Histidine	2.71	3.80
Monoamino	70.10	69.19

Sericin A was found to contain 0.45 per cent of sugars and 0.37 per cent of amino sugar, whereas Sericin B contained 1.08 per cent of sugars and 1.27 per cent of amino sugar.

When Sericin A and Sericin B were heated with water, a large evolution of ammonia took place. The liberation of ammonia was especially marked in the A type of sericin. A small amount of ammonia is usually liberated during the degumming of raw silk. After the silk had been degummed with hot water or with a soap solution it still contained a small amount of sugars and a trace of amino sugar.

Silk Wax

Bergmann has recently devoted his attention to the natural wax which is extracted by either from raw silk or from exuviae of the silkworm, *Bombyx mori*. The extract from the exuviae consisted largely of cuticulin, which is the principal component of the epicuticle or the extremely thin wax-like film which covers the skin of the worm. Cuticulin resembles the cuticle of plants. In mature larvae, the content of cuticulin ranged from 0.35 to 0.45 per cent. On saponification, the cuticulin yielded 55 to 60 per cent of nonsaponifiable material which consisted of paraffin hydrocarbons and higher fatty alcohols, and 23 to 24 per cent of higher fatty acids. Thus the cuticulin of silkworms appeared to be a mixture of esters of alcohols and acids containing 26 to 30 carbon atoms with paraffin hydrocarbons containing 27 to 31 carbon atoms.

The ether soluble fraction of white Chinese silk contained a mixture of normal primary alcohols and acids of the order C_{26} to C_{32}, paraffins of the order C_{25} to C_{31}, and liquid fatty acids. This silk wax is very resistant to the action of chemicals, not being appreciably affected by warm concentrated hydrochloric, nitric or sulfuric acids. It closely resembles the cuticulin of the silkworm.

It was found that the silk wax was not very evenly distributed through the different layers of the cocoon. The highest concentration of wax was found in the outside layers and it decreased steadily from the beginning to the end of the fiber as it was reeled off from the cocoon. A similar variation has often been noted in the sericin content of the silk fiber. However, these variations in the content of wax or sericin are not very noticeable in the commercial raw silk thread because the fibres of the cocoons of different stages of unwinding are combined to form one thread. This thread thus represents the average physical and chemical composition of the individual fibers.

The ether soluble fractions of a series of raw silk samples were expressed in terms of the E.S. number, i.e., the number of milligrams of ether soluble material obtained from 10 grams of silk. The E.S. numbers of 77 per cent of all lots of white Japanese silk fell between 40 and 60 with an average of 55. The average of the E.S. numbers of white Chinese silks was about the same as the white Japanese silks, but yellow Japanese and Italian silks had E.S. numbers between 90 and 100.

No apparent relation appeared to exist between the E.S. number and the nature, boil-off, tenacity, elongation, cohesion and resistance to friction of raw silk. However, a determination of the speed of wetting by the Draves' test showed that the wax removal reduced the sinking time from many seconds or even several minutes to fractions of a second.

CHAPTER 2

THE PREPARATION OF SILK

The operations included under this heading are reeling, soaking, degumming, bleaching and weighting. The cocoons are first cooked in hot water to soften the silk preparatory to reeling into skeins. Japanese investigators have recently studied the effects of salts in the water during the cooking process upon the color and luster of the raw silk. Salts of iron, copper, aluminum and calcium were added to the cooking water in proportions varying from 0.0001 per cent to 0.001 per cent on the weight of the solutions, and cocoons were immersed in the boiling solutions for a definite period of time. None of the salt solutions in the above concentration showed any appreciable effect on the color of the raw silk.

The proportions of the salts were then increased up to 0.01 per cent and at this concentration the whiteness of the silk was noticeably decreased by the iron and copper solutions, somewhat by the aluminum solutions and just slightly by the calcium solutions. The same effects were noticed when skeins of raw silk after reeling were boiled in the aqueous solutions of the above metallic salts.

Several new patents deal with the soaking of raw silk preparatory to winding and warping. One patent claims the use of sulfonated fatty alcohols whose value for this purpose is enhanced by their hygroscopic qualities. Soaps of low alkalinity are added to the bath as protective agents for the silk during the soaking. Another patent deals with the acceleration of the take-up of oil by the silk from the usual oil and soap, or sulfonated oil emulsion. Carbon dioxide is bubbled through the bath and this appears to have the effect of rapidly transferring the oil from the bath to the silk.

The use of negatively charged oil emulsions was mentioned in the previous review but has subsequently been amplified by additional patents. A negatively charged emulsion of sulfonated olive oil is gradually discharged onto the silk by the addition of ammonium sulfate, ammonium chloride or ammonium fluosilicate. The ammonium salts may be replaced by certain dilute acids and glycerine or glycol may be added to the bath.

There have been very few new developments in the degumming, bleaching or weighting of silk during the past year. Two Japanese investigators have studied the variations in the zeta-potential during the degumming of silk by water. When the zeta-potential was plotted against the time of cooking the curve of incompletely degummed silk was similar to that obtained for lyophilic colloids in general, with no minimum. The suitability of perborates for the bleaching of silk has also been discussed.

CHAPTER 3

THE DYEING AND FINISHING OF SILK

Dyeing

A comprehensive study of the action of acid and basic dyes on silk has recently been published. The silk used was a crepe fabric from which the sericin had been removed by a boiling-off process. The degummed samples of silk were rinsed with successive baths of hot distilled water until there was no further change in the pH of the rinse solution. Distilled water was used in making up the dye solutions and no substance other than dye was added to the bath except in the experiments in which the initial pH of the bath was adjusted with small amounts of hydrochloric acid or sodium hydroxide.

Three azo dyes (a green, a blue and a yellow) were selected as representative of the acid group and four triphenylmethane dyes (a brown, two violets and a green) typified the basic group. In a preliminary series of tests, the temperatures of the dyebaths were varied from 2° C. to 97° C., and the time of dyeing from 2 hours to 16 hours. It was found that an equilibrium in the amount of dye taken up by the silk, was reached at or near the end of an 8-hour period at 25° C. This time and temperature were therefore used for the remainder of the experiments.

The effects of changes in the initial concentration of the dye solution were next studied. With all of the seven dyes, logarithmic curves of the take-up of dye plotted against equilibrium concentration according to Freundlich's equation for adsorption were straight lines. Therefore, it was concluded that, under the conditions studied, the dyeing of silk with both the acid and the basic dyes, was an adsorption process. It was noted that the solutions of the four basic dyes decreased in pH as the concentration

was increased. Inasmuch as these dyes were hydrochlorides, this change in pH was explained on the basis of hydrolysis with liberation of increasing amounts of hydrochloric acid. The acid dye solutions did not show appreciable changes in initial pH within the range of concentrations studied.

In studying the effect of initial pH upon dye adsorption by the silk, it was found that maximum adsorption of the basic dyes took place in the pH range of 6 to 8, with the exception of Methyl Violet where the range of maximum adsorption was from 4 to 8 pH. The adsorption of the acid dyes by the silk increased steadily as the hydrogen-ion concentration of the bath was increased and the pH was lowered, down to a range of 2.5 to 3.5 pH. Below that range the adsorption decreased again.

A study was also made of the change in hydrogen-ion concentration during dyeing in baths of different initial pH. With all of the dyes, the silk took a larger amount of hydrogen than of hydroxide-ion out of the bath at low pH values, and vice versa at higher pH values. The pH value at which the transition occurred between the raising and lowering of the pH during dyeing, was between 2 and 3 for all of the basic dyes, between 4 and 5 for the acid blue and the acid green, and between 6 and 7 for the acid yellow.

A Japanese investigator has reported on the affinity of various acid dyes for silk. The affinity of each type of dye was shown to vary with the acidity and the temperature of the dyebath, and with the quantity and type of neutral salts added to the bath. A recent patent claims that the affinity of acid dyes for silk and wool is increased by subjecting the material to the action of an alkyl ester, such as ethyl bromide, or a diazo paraffin, such as diazomethane. This reaction is used in some cases to increase the speed of adsorption of the dyestuffs by the fiber, and in other cases to improve the fastness to washing of the dyed material.

A new method of improving the even distribution of acid dyes on animal fibers is proposed in another patent. This consists in the addition to the dyebath of a new class of leveling agents which are described as alkyl phenol sulfonates. The alkyl group contains a high number of carbon atoms and is preferably a cetyl or stearyl group. A concentration of slightly less than 0.1 per cent of the leveling agent on the weight of the solution is sufficient to exert a marked leveling action during dyeing.

Several general discussions of the production of suitable blacks on silk have appeared in foreign journals, and the dyeing of natural silk in silk-wool union fabrics has also been described. The so-called "Escaich Process" has been reviewed in a French journal. In this process, silk or wool are dyed in a bath containing an organic acid, a metallic salt and a nitrite. Shades of yellow, red, garnet and green are obtained with salts of aluminum, copper, nickel, cobalt or iron. The colors are obtained in a short time with a cold bath, and they can be made resistant to washing and light.

Printing

A French patent described the printing of fast colors on natural silk by the use of the so-called soluble vat dyes which are esters of the leuco derivatives of the ordinary vat dyes. After the dyes are applied to the silk fabrics, it is necessary to hydrolyze the ester and oxidize the leuco dye in order to render it insoluble. This is ordinarily accomplished in an acid chromate solution and this solution sometimes has a tendency to yellow the silk. It has now been found that this yellowing action is prevented if the chromate oxidation as carried out in the presence of certain easily oxidizable compounds such as pyrocatechol, resorcinol or gallic acid.

The general subject of printing silk underwear with vat colors was also discussed in a French journal and formulas suitable for the production of representative shades were given.

Finishing

Several discussions of the finishing of pure silk fabrics and of fabrics containing both silk and rayon have appeared in French and German publications. The old subject of luster has received further attention and certain chemical treatments are described which have the effect of brightening the silk. A German patent describes the production of lustrous designs on silk or rayon fabrics by treating them at 20° C. with a 5° Bé. solution of aluminum chloride, then calendering or impressing a design at about 130° C. The technique of applying so-called pulverized finishes to silk and rayon fabrics has been outlined and a number of formulas have been suggested.

Further developments have taken place in the production of crush-proof velvets composed of a silk back and a rayon pile. The original process consisted of an impregnation of the pile with a partially condensed mixture of urea and formaldehyde and a subsequent setting of the resin in the fibers with the aid of heat. The disadvantage of this treatment was that it resulted in a noticeable increase in the body of the fibers, which was not so desirable in the case of especially lightweight or sheer fabrics, such as the so-called wedding-ring velvets.

A modification of this process which does not add any appreciable weight or body, has been patented in this country and abroad. The fabric is treated with formaldehyde alone in the presence of a catalyst such as ammonium chloride and then subjected to the action of heat. A softening agent such as formamide and a stabilizer for the cellulose-formaldehyde reaction product may be added to the formaldehyde solution. It is claimed that the resultant crush-resistant effects are relatively permanent even in atmospheres containing high relative humidity.

The resistance of silk, rayon or linen fabrics to slippage is improved, according to a recent United States patent, by treating the fabrics with a solution containing iron, aluminum or chromium.

The preparation of oil silks has received further attention. It is stated that silk intended for oiling must be free

from all foreign substances such as sizes or mineral salts. If the silk is dyed, the dyes must be insoluble in the oiling medium. For electrical purposes the silk should be brought to its isoelectric point before oiling. The resistance of the oiled silk to deterioration with age is determined by measuring the change in bursting strength and tearing strength after heating for four weeks at a temperature of 105° to 115° C.

Miscellaneous

The use of wetting agents in the processing of silk, as well as other textile fibers, is receiving an increasing amount of attention. It has been stated that a better cleansing of silk and rayon is obtained by the use of carefully selected fatty alcohol sulfates than with the usual detergents such as soaps or mild alkalies. The fatty alcohol sulfates also promote level dyeing and the penetration of the dyestuffs into the fibers. They provide freedom from cloudiness and in creping operations they prevent the formation of scum marks and water stains.

Quaternary ammonium salts are now being marketed in the textile field as (1) stripping agents for azoic or vat dyeings by acting as reduction catalysts or solubilizing and emulsifying agents, (2) permanent finishing agents giving increased luster, improved handle and water-repellent effects, and (3) agents for increasing the fastness to water of dyeings made with substantive or direct dyes.

Several general discussions during the past year have dealt with the preparation, dyeing and finishing of pure silk and silk-rayon fabrics as well as semi-silk satins. The Italian and Japanese methods of manufacturing silks have been compared. Instructions have been given in a United States patent for the removal of silk from mixed wool and silk fabrics. The silk is dissolved out of such fabrics by treatment with a hot concentrated solution of zinc chloride and calcium chloride which is kept substantially free from any inorganic acid.

CHAPTER 4

THE PROCESSING OF SILK HOSIERY

The various steps in the dyeing and finishing of silk hosiery have been described by a practical silk dyer. The most widely used machine is the rotary drum or wheel of the type used in laundries, and the stockings are placed in cotton mesh bags before packing in the machine. For light and medium shades it is customary to boil-off and dye in one operation whereas for dark shades and for whites the degumming is usually performed in a preliminary bath.

In boiling off the silk, soaps or special boil-off oils may be used but in either case the pH of the bath should not be over 11 at the start or under 8 at the end. It is considered good practice to start the hosiery in a bath containing one-third of the boil-off agents and boil for 10 minutes. This bath is then drawn off and a fresh bath prepared with the remainder of the boil-off agents and the dye. The hosiery is boiled in this bath for 20 minutes, then salt is added to exhaust the dyebath and the boiling continued for 20 minutes more.

Good hosiery dyes should exhaust well from a soap bath and at the same time be capable of being stripped from the silk with a hydrosulfite solution in the event of improper dyeing. The color should be fairly fast to washing, perspiration, sunlight and stoving. Finishes for silk hosiery usually consist of a dulling agent, a gum or a mixture of gums, and a waterproofing agent. The bleaching of silk hosiery is usually accomplished with a solution of hydrogen peroxide stabilized with silicate of soda.

A British textile journal has recently published a general discussion of the union dyeing of hosiery containing silk in combination with wool, viscose rayon and cellulose acetate rayon. The dyeing of iridescent hosiery was considered in an issue of this journal published toward the end of last year.

A German patent describes a complicated mixture of resins, waxes and gums which is claimed to be effective in preventing runs in silk or rayon knit goods, including hosiery. A British patent claims that silk, wool, cotton or rayon hosiery may be waterproofed by treating them with an emulsion containing soybean protein, a solubilizing alkali, an emulsifying agent such as ammonium oleate, and paraffin wax. A second treatment in a solution of aluminum sulfate is then given. The protein material may be rendered more resistant by an additional treatment with formaldehyde.

BIBLIOGRAPHY

NOTE:—This bibliography deals primarily with the period from Nov. 1, 1938 to Aug. 1, 1939. However, there are included some references of earlier dating which have not been recorded in previous reviews.

1. The Chemistry of Silk

Fibroin

Textile Fibers—Chemical and Physical Aspects, J. ALEXANDER, Ind. Eng. Chem. *31,* 630-42 (1939).

Chemical Constitution of the Cocoon Silk of *Eriogyma pyretorum* and *Theophilia mandarina.* II, Amino Acid Composition of the Cocoon Silk of *Theophilia mandarina,* INOUYE, MATUURA and TANOUYE, Bull. Sericult. Silk-Ind. (Japan) *10,* 81-8 (1937).

The Acetylation of Silk Fibroin by the Action of Acetic Anhydride, EDWARD CARR, Text. Research *8,* 399-405 (1938).

Spinning Solutions of Silk Fibroin, etc., NORTH AMERICAN RAYON CORPORATION, U. S., 2,145,855-6-7, Feb. 7, 1939.

The Swelling of Raw and Boiled-off Silk in Relation to Width Measurement, R. INGRAM, Text. Research *9,* 79-89 (1938).

Effects of the Orientation of Micelles Upon the Various Properties of the Fibroin Fiber, III, Strength, Elongation

and Degree of Orientation, T. MATANO, J. Soc. Chem. Ind. Japan *42*, Suppl. binding, 32-3 (1939).

Sericin

Sericin, III, Nitrogen Distribution and the Contents of Sugars and Amino Sugar in Sericin, T. ITO, J. Agr. Chem. Soc. Japan *15*, 50-2 (1939); IV, Changes by Heating Wet Silk Protein, Ibid, 53-5 (1939).

Silk Wax

Composition of Ether Extractives from Exuviae of the Silkworm, *Bombyx mori*, W. BERGMANN, Ann. Entomol. Soc. Am. *31*, 315-21 (1938).

A Study of the Composition of the Ether-Soluble Fraction of Raw Silk, W. BERGMANN, Text. Research *8*, 221-5 (1938).

The Distribution of Wax in Cocoon Silk, W. BERGMANN, Text. Research *8*, 195-9 (1938).

Silk Wax and Certain Physical Properties of Raw Silk, W. BERGMANN, Text. Research *9*, 175-82 (1939).

2. The Preparation of Silk

Effects of Salts in Water for Silk Reeling on the Color and Luster of Raw Silk. I, Salts in Water for Cooking and Reeling of Cocoons, NAKAHAMA and NISIMURA, J. Agr. Chem. Soc. Japan *14*, 843-53 (1938).

Raw Silk Soaking and Oiling, R. SEMMLER, Can. Text. J. *55*, No. 12, 37-8 (1938).

Natural Silk, DE SELLE and PAUME, Fr. 827,836, May 4, 1938.

Soaking Silk Yarns, RICHARDS CHEMICAL WORKS, U. S. 2,135,081, Nov. 1, 1938.

Soaking Fibers, WARWICK CHEMICAL Co., Brit. 485,398, May 19, 1938.

Electrokinetic Investigations on Natural Silks, TAKADA and KANAMARU, Kolloid-Z. *87*, 68-73 (1939).

Perborate for Bleaching Silk, C. DOWNIE, Silk & Rayon *13*, 414 (1939).

3. The Dyeing and Finishing of Silk

A Study of the Reactions of Silk Fibroin with Acid and Basic Dyes, HOFFMAN and MACK, J. Phys. Chem. *43*, 647-62 (1939).

Effects of Acid Colors Dissolved in an Acid Bath on Silk Fibers, T. KOMATU, Bull. Sericult. Silk-Ind. (Japan) *10*, 11-13 (1937).

Increasing the Affinity of Acid Dyes for Wool, Silk, Leather, Etc., I. G. FARBENIND., U. S. 2,131,145, Sept. 27, 1938.

Dyeing Animal Fibers, NATIONAL ANILINE & CHEMICAL Co., U. S. 2,133,288, Oct. 18, 1938.

The Black Dyeing of Silk Strands, A. FRANKEN, Wollen & Leinen-Ind. 58, 306-7 (1938).

Aniline Black on Silk Fabrics for Umbrellas, J. BRUYER, Rusta-Rayonne *13*, 490-1 (1938).

Treatment of Natural Silk in Presence of Wool, J. GARSIDE, Rusta-Rayonne *13*, 425-31 (1938).

Notes on the Escaich Process, J. GAUDIT, Teintex *4*, 6-9 (1939).

Printing

Dyeing and Printing Silk, DURAND & HUGUENIN, S.A., Fr. 835,854, Jan. 5, 1939.

Pure Silk Underwear Imprinted with Vat Colors, A. FRANKEN, Teintex *3*, 157-8 (1938).

Finishing

Observations in the Brightening of Silks, MARTOTTE, Deut. Wirker-Ztg. *58*, No. 21, 25-6 (1938).

Treatment of Silk or Rayon Fabrics, C. WIRTH, Ger. 643,285, Nov. 12, 1938.

Application of Pulverized Finishers to Silk and Rayon Fabrics, C. THIBAUD, Teintex *3*, 415-7 (1938).

Anticrease Treatments, E. I. DU PONT DE NEMOURS & Co., Brit. 491,779, Sept. 5, 1938.

Increasing the Slip Resistance of Fabrics, ROHM & HAAS COMPANY, U. S. 2,134,579, Oct. 25, 1938.

Metallic Decorated Oil Silks, F. WARNER, Silk J. & Rayon World *15*, No. 173, 29 (1938).

Development of Oil Silks, F. WARNER, Silk J. & Rayon World *15*, No. 179, 31 (1939).

A New Method for the Elimination of White Spots in Dyed Pure Silk Fabrics, Y. TYUMENEV, Shelk *7*, No. 2, 52 (1937).

Miscellaneous

Developments in Silk and Rayon Dyeing and Finishing, R. J. SMITH, J. Soc. Dyers Colourists *55*, 247-50 (1939).

Wetting Agents in Textile Processing. Derivatives of Arylamine Sulfonic Acids, UPPAL and VENKATARAMAN, J. Soc. Dyers Colourists *55*, 125-34 (1939).

Developments in the Material and Modern Processes of Dyeing and Finishing, P. COLOMB, Teintex *4*, 275-96 (1939).

Notes on the Preparation and Dyeing of Rayon, Silk-Rayon and Rayon-Cotton Cloths, P. COLOMB, Teintex *4*, 9-16 (1939).

General Treatments of Raw Silk Satin, G. DELAVAL, Rusta-Rayonne *13*, 307-15 (1938).

Italian and Japanese Methods of Manufacturing Silks, P. RUFFINI, Deut. Wirker-Ztg. *58*, No. 19, 6-7 (1938).

Removing Silk from Mixed Wool and Natural Silk Fabrics, C. FERGUSON, U. S. 2,152,640, April 4, 1939.

Recent Developments in the Chemistry of Silk and Silk Processing, W. M. SCOTT, Am. Dyestuff Reporter *27*, 710-16 (1938).

4. The Processing of Silk Hosiery

Dyeing and Finishing of Silk Hosiery, P. DUGGAN, Am. Dyestuff Reporter *28*, 218-9 (1939).

The Dyeing of Silk and Rayon Hosiery, C. WILKINSON, J. Soc. Dyers Colourists *55*, 208-11 (1939).

The Dyeing of Iridescent Hosiery, H. DIXON, Am. Dyestuff Reporter *27*, P520-2 (1938).

Treatment of Silk or Rayon Knitted Fabrics, W. BOHME, Ger. 660,071, Sept. 21, 1938.

Waterproofing Hosiery, INSTITUTE OF PAPER CHEMISTRY, Br. 498,771, Jan. 13, 1939.

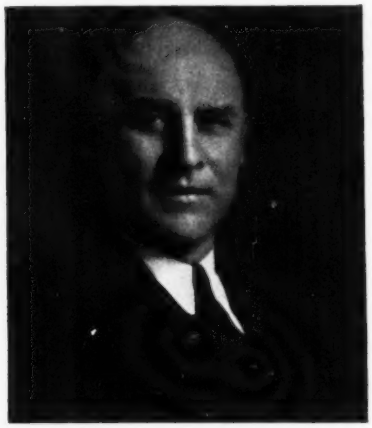
TRADE NOTES • NEW PRODUCTS

• JOINS GENERAL DYESTUFF

Dr. Carl Z. Draves, formerly with Ludlow Mfg. Associates, has joined the technical department of General Dyestuff Corp., 435 Hudson St., New York, N. Y.

• JOINS HARDESTY

Warren T. Reddish, president of the Twitchell Process Company prior to its merger with Emery Industries, Incorporated, and later vice-president of the consolidated companies, resigned March 31st, 1939. Mr. Reddish has joined the official family of the W. C. Hardesty Co., Inc., as vice-president in charge of manufacture, developments and specialty sales. The main office of the W. C. Hardesty Co., Inc., is located at 41 East 42nd St., New York, N. Y., with plants in Dover, Ohio, Los Angeles, California, and Toronto, Canada.



Mr. Reddish will make his headquarters at Dover, Ohio. His long experience in the chemical industry will be continued in a rapidly expanding organization, which has plans for the manufacture of fine as well as heavy chemicals. The many friends of Mr. Reddish in the chemical field wish him success in his new duties.

• ROHM & HAAS RELEASE

Rohm & Haas Co., Inc., 222 West Washington Square, Philadelphia, Pa., has recently issued a new bulletin entitled "RHonite Emulsions" which represent a complete line of urea formaldehyde resins for textile finishing. Special emphasis is placed on RHonites W-250, W-333 and W-400. Copies are available upon request.

• FOLDER ON "CELLOSOLVE" SOLVENTS

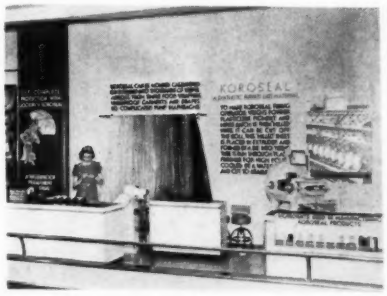
Carbide and Carbon Chemicals Corporation announces the publication of a new folder entitled "Cellosolve Solvents." Known as Chemical Group Folder No. 3, this publication is the third of a series of pamphlets designed to present, briefly and concisely, information on industrial organic chemical families. This folder describes eight "Cellosolve" ether-glycols and two "Cellosolve" ether-glycol acetates. A convenient table presents their principal properties—boiling points, specific gravities, flash points, toluol or xylene dilution ratios, solubilities in water and hydrocarbons, as well as solvent powers for certain resins.

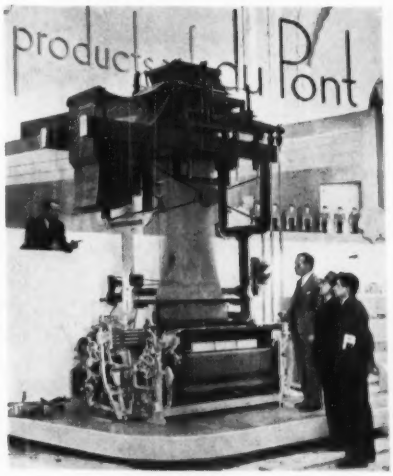
The "Cellosolve" compounds actually belong to three chemical families—the ethers, the hydrocarbons, and the alcohols. They show exceptional dissolving powers, and are particularly interesting to solvent-consuming industries. The group of solvents offers a wide choice of boiling points and evaporation rates and is thus useful in many applications. Copies of "Cellosolve Solvents" can be obtained from Carbide and Carbon Chemicals Corporation, 30 East 42nd Street, New York, N. Y.

• AT THE NEW YORK WORLD'S FAIR

RIGHT—Loom with Jacquard attachment at the du Pont building.

BELOW—Koroseal manufacturing-fabricating booth in the B. F. Goodrich building.





• CIBA REVIEW

Copies of *Ciba Review*, Number 24 for August, 1939, have recently been distributed. Featured in this issue is "The Basle Ribbon Industry." Contents are described by the following titles: From the History of Basle; The Ribbon Industry of Basle; Ribbons and Fashions; The Basle Silk Dyers; The Peculiarity and Economic Significance of the Basle Ribbon Industry in the 19th Century; The Technique of Ribbon Weaving; Statistics on the Growth and Decline of the Basle Ribbon Industry; Historical Gleanings. Also included is a supplement entitled "Fixing Agents in Screen Printing."

• ATLAS RELEASE

Atlas Electric Devices Co., 361 W. Superior St., Chicago, Ill., has recently distributed a booklet on the Fade-Ometer which contains a description of tests on all kinds of decorative fabrics and the value of such tests from the standpoint of the manufacturer and the dealer. It further contains an illustration of typical Fade-Ometer tests and government specifications covering mohair pile fabrics, carpets and rugs, wallpaper and textiles in general. A major portion of the booklet consists of an article entitled "Practical Facts About Color Fastness of Tapes and Cords from a Manufacturer's and Dealer's Point of View" by Carl B. Holm which is reprinted from the *Venetian Blind Dealer*. Copies are available upon request.

• ENDURETTE PLANT

Endurette Corp. of America announces the opening of its new plant in Cliffwood, N. J. General offices are at 230 Fifth Ave., New York, N. Y. The company is engaged in the manufacture of waterproofed fabrics, oils, chemicals and varnishes.

• TENNESSEE FOLDER

The Tennessee Corp., Atlanta, Ga., has recently released a folder entitled "Tennessee Ferric Sulfate." The product is intended for use in the treatment of sewage and sewage sludge as a coagulant where ferric salts are indicated, such as in the treatment of industrial wastes from textile mills and paper mills, for the removal of dissolved chemicals and organic matter and for the treatment of drinking water supplies where a ferric salt is required for best coagulation. Advantages claimed are: stability, solubility in cold water, already oxidized and ready to use, eliminates maintaining proper chlorine-iron ration and will store over long periods. Copies of the folder are available upon request.

BOOK REVIEW

Rayon and Staple Fiber Handbook, *by Herbert R. Mauersberger and E. W. K. Schwarz; third edition; 5½" x 7¾"; 832 pages, 22 chapters, 300 illustrations, photomicrographs, tables and charts. Rayon Handbook Co., New York City; $4.50 per copy in U. S. A. and Canada, $5.75 in foreign countries.*

The third edition of this valuable handbook has been completely revised, enlarged and brought up to date. The first two editions were entitled "Rayon and Synthetic Yarn Handbook" and "Rayon and Staple Fiber Handbook," respectively. The amount of text matter in the present book is double that of the first edition. Two entirely new chapters have been added: "The Manufacture of Rayon Staple Fiber and Spun Rayon Yarns" and a "Glossary of Rayon Terms."

Of special interest to readers of this journal are the chapters on dyeing, printing and finishing which discuss among other things the newer developments such as inhibiting acetate rayon fading, package dyeing of acetate rayon, application of synthetic resins, non-slip and anti-crease finishes. Various manufacturers have tested their dyes for the effect of the anti-crease process. Changes as to shade fastness to washing and light are recorded. A complete line of textile chemical auxiliaries has been added. Printing with resins and lacquers is dealt with extensively and with the advent of staple fiber and spun rayon fabrics such processes as napping, decating and shearing were included.

The contents of the book are logically arranged and include a complete subject index. According to the table of contents the 22 chapters deal with the following topics: Historical Background of the European and American Rayon Industry; Economic and Statistical Background; Raw Materials and Their Preparation; Principal Yarn Manufacturing Processes; Manufacture of Staple Fiber and Spun Rayon Yarns; Soaking, Spooling and Throwing; Warping and Warp Sizing or Slashing; Weaving of Rayons and Spun Rayons; Commercial Rayon Grey Goods Constructions; Manufacture of Rayon Knit Goods; Dyeing of Rayon Yarns and Goods; Printing of Rayon and Acetate Fabrics; Dry Finishing and Special Processes; Physical Testing of Rayon Yarns and Staple Fiber; Chemical Tests; Methods of Identification; Dry Cleaning of Rayon and Spun Rayon Materials; Laundering of Washable Rayon and Spun Rayon Materials; American Trade Marks and Rayon Brandnames; Rayon Yarn and Staple Fiber Producers in the U. S. and the World; Glossary of Rayon Terms; American and Foreign Literature; Subject Index.

• CLASSIFIED •

POSITION WANTED: Chemist with practical dyeing and finishing experience on pile fabrics, including non-crush velvets, moth proofing of mohair upholstery plush, and water repellent cotton plush. Write Box No. 203, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Dyer with thorough practical and technical experience on cotton and rayon in any form and in any type of equipment. Textile school graduate, married. Age 38. At present employed but desires change for advancement. Confident of making savings in any dyehouse, etc. Write Box No. 204, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Opening abroad available for graduate Textile Chemist with minimum five years' practical dyeing or printing experience. Single man with knowledge of Spanish preferred. Full details required first letter. Write Box No. 205, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Competent textile chemist and dyer desires connection with dyehouse or dyestuff manufacturer. Can organize laboratory, direct purchasing, calculate processing costs and handle trouble-shooting. Likes to co-ordinate or reorganize outmoded processing methods to meet mass-production requirements. Has had 11 years' experience in this work, including four years with large dyestuff manufacturer as technical representative. Now employed, will consider full employment or modest consulting arrangement. Thorough investigation of ability and character invited. Age 35, married. Write Box No. 206, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

SITUATION WANTED, FEMALE: Stenographer thoroughly experienced, several years with large dyestuff concern, seeks position in metropolitan area. Write Box No. 207, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Wool Dyer—I have had many years' experience in the largest woolen mills in Hungary. Am thoroughly familiar with all types wool dyeing. Would appreciate opportunity of demonstrating my ability. Write Box No. 208, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Englishman, desires responsible position. Expert dyer all styles acetate and viscose silk piece goods. 20 years' experience. Age 35. Married. Write Box No. 209, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Excellent opportunity for Chemist with broad operating experience to develop and demonstrate important chemical products sold to cotton printers and finishers. Reply in confidence. Write Box No. 210, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Dyestuff Jobber or Textile Chemical Salesman with following. Add line of dye assistants and specialties to present line. Write Box No. 211, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

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